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ABSTRACT

This partially annotated bibliography on marine environment contains a list of learning experiences and curriculum units for elementary and secondary students. A majority of materials were published in the 1970s. Subjects include biological oceanography, which deals with general and specific aspects of marine biology such as plankton, invertebrates, marshes, and aquaria; physical and chemical oceanography which includes tides, waves, seawater composition, and water pollution; and geological oceanography, which covers beaches, tectonics, and sea floor topography. The final category, general oceanography, cites materials which cover more than one topic or which fit into categories such as resource economics and resources from the sea. This section is divided into two parts: laboratory experiments or field investigations and classroom materials. The catalog is divided into two sections: units suitable for elementary level and those suitable for the secondary level. Entries within each section are listed alphabetically according to author or sponsoring organization. (Author/KC)

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A Catalog of
CURRICULUM MATERIALS
for
MARINE ENVIRONMENT STUDIES
Elementary and Secondary

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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The development of this catalog depended on the cooperation of many educators across the country, especially members of the National Marine Education Association.

No doubt there are excellent teaching materials unknown to the editor. Please send copies for inclusion in the next edition to Project COAST, 204 Willard Hall, University of Delaware 19711.

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PROJECT COAST

A CATALOG OF CURRICULUM MATERIALS
FOR MARINE ENVIRONMENT STUDIES

This partially annotated bibliography contains a list of learning experiences and curriculum units that can be used directly by the teacher with little or no modification. The Catalog is divided into grade levels. The Elementary Level subheading includes lists of coastal and oceanic units for K-6 grades. They can, however, be modified for use at other grade levels. The Secondary Level category includes units directed toward secondary students (7-12), but may be of interest to elementary school teachers.

Because of the variety and the large number of secondary entries, this category has been organized into the following subjects:

BIOLOGICAL OCEANOGRAPHY. Deals with general and specific aspects of marine biology such as plankton, invertebrates, fish, marshes and aquaria.

PHYSICAL AND CHEMICAL OCEANOGRAPHY. Deals with waves, tides, sea water composition, water pollution, etc.

GEOLOGICAL OCEANOGRAPHY. Covers beaches, plate tectonics and sea floor topography.

GENERAL OCEANOGRAPHY. Cites materials that cover more than one topic or that fit into categories such as resource economics and resources from the sea. This section is divided into two parts: laboratory experiments or field investigations and classroom material.

Project COAST at the present time does not disseminate the materials listed here. We suggest you contact the publisher or author, where possible, to find out about the availability of the material.

Many of the annotations in this bibliography were written by people other than the compilers. This is noted after the annotation by an "A:" followed by the author's name. Two major sources of annotated materials came from bibliographies by Myra J. Morgan and Richard M. Schlenker, and we express our thanks for being able to include their work. Annotations from these sources are noted by "MB" or "SB" standing respectively for:

Morgan, Myra J. 1974. A BIBLIOGRAPHY OF ELEMENTARY AND SECONDARY MARINE SCIENCE CURRICULUM PROJECTS AND EDUCATION MATERIALS. University of Rhode Island Marine Bulletin Series No. 15. New England Marine Resources Program. Narragansett, RI 02882. 23 p. ERIC ED 089 995

Schlenker, Richard M. 1976. A PARTIAL BIBLIOGRAPHY FOR PRECOLLEGE MARINE SCIENCE EDUCATORS. University of Maine Sea Grant. Orono, ME 04473. 94 p.

A CATALOG OF CURRICULUM MATERIALS
FOR MARINE ENVIRONMENT STUDIES

ELEMENTARY LEVEL

Abrams, Isabel S. 1970. PRIMARY GRADE OCEANOGRAPHY. Grades 1-3. Winnetka Elementary Schools and the Dept. of Naval Research, Chicago. 5 pages.
A summary of a unit on introducing oceanography to primary school youngsters. Activities such as working on a mural that illustrates the food chain in the ocean, examining a fish skeleton, etc. are explored.

Awkerman, Gary L. 1973. ASPECTS OF MARINE ECOLOGY. Charleston County School District. North Charleston, SC. 55 p.

Bailey, Robert S. and Fred C. Biggs. 1968. THE ADVENTURES OF LITTLE OYSTER. Virginia Institute of Marine Science, Gloucester Point, VA, 23062. 23 p.
An illustrated story that follows the life history of an oyster in the Chesapeake Bay.

Bellerophon Books. 1973. A COLORING BOOK OF SHIPS. Bellerophon Books, 133 Steuart St., San Francisco, CA, 94105. 48 p.
Includes historical notes and legends with illustrations of ships from Egyptian reed boats to modern battleships. Drawings are simplified versions of museum works of art and locations of originals are cited.

Bennett, Lloyd M. 1964. MARINE LIFE: FOR FIFTH GRADE. Science Education, 48 (5): 404-18.
This is a nine-day unit. Scientific background information is provided for teachers along with activities and tests. SB *

Bethlehem Area Schools. 1968. DIGGERS TO DIVERS, GEOLOGY K-6; ELEMENTARY SCIENCE UNIT NO. 2. Bethlehem School District, Bethlehem, PA. ERIC ED 033 036. 217 p.
A discovery approach to child-centered learning for grades 4 and 5. Petrology is the major emphasis in grade 4, and oceanography is the major emphasis in grade 5. Other aspects of geology are covered for other grades.

Betts, Linda Anne. 1973. "YELLOW SUBMARINE," THE CHILDREN'S M[illegible], A MID-TENNESSEE PROJECT, A GUIDE TO THE "SEE" IN TENNESSEE. Mobile Museum. Nashville, TN. 75 p.

Beyerle, Jeannette. 1970. THE OCEAN. Marine Science Center. Newport, OR. 92 p.
This fourth-grade curriculum includes lessons on ten topics: explorers, vessels, instruments, physical features, currents, waves, tides, life cycles, zones and economic values of the ocean. Each lesson also includes possible activities, audio-visual materials, books, tests and answers. Gr. 4. MB.*

Bilodeau, Ronald C. and Judy Sullivan. 1977. LONG ISLAND SOUND. Children's Museum of Hartford. West Hartford, CT.

Booth, Sally and Vicki Osis. 1977. ROCKY BEACH ANIMALS, A COLORING BOOK. Oregon State Univ. Foundation, Corvallis, OR, 97330. 23 p.
Includes simple matching and classifying activities using the animals pictured in the book.

Boragine, Ruth. 1976. TALL SHIPS: A CULTURAL, HISTORICAL VIEW OF OUR MARINE SCIENCE; Massachusetts Cooperative Extension Service, Barnstable, MA, 02630. 50 p.
Activities in art, mathematics, language arts, social studies, music, drama associated with ships and the sea.

Borden, Charles D. 1970. THE DEVELOPMENT OF A MODEL FOR BUILDING MARINE SCIENCE LEARNING ACTIVITIES FOR INDIVIDUALIZED INSTRUCTION OF ELEMENTARY PUPILS IN CONNECTION WITH A MARINE SCIENCE LABORATORY CURRICULUM. Masters Thesis, Seattle Pacific College, Seattle, WA. SB. *

Bower, Carol E. 1975. THE SEA IS THE EASIEST PLACE ON EARTH TO LIVE. The Aquarium, Children's Museum of Hartford. West Hartford, CT. 33 p.

Callaghan, Sara S. No date. DOWN WHERE THE WATER IS: A COASTAL AWARENESS ACTIVITY BOOK. Rhode Island Coastal Resources Management Council, University of Rhode Island. Providence, RI 02903.

Calligan, Sarah S. 1977. TEACHER'S ACTIVITY GUIDE TO COASTAL AWARENESS. Elementary. Coastal Resources Center, Univ. of R.I., Providence, R.I. 02903. 85 pages.
Elementary curriculum resource materials to introduce the c ncept of coastal management.

Cape Ann Society for Marine Science. No date. SEASHORE COLORING BOOK. Cape Ann Society for Marine Science, Inc. Gloucester, MA 01950.

* SB, *MB See Foreword.

Cape Cod Extension Service. No date. PACKET OF ACTIVITY SHEETS. Cape Cod Extension Service, Railroad Ave., Barnstable, MA.
"Always in process of change -- presently includes Sorting Shells, Crabby Crabs, Sign of Five (incomp.), Who Laid the Egg (incomp.), Animals Living Together (incomp.), Making Waves." A: Barbara Waters of Cape Cod Extension Service.

-----. 1975. CAP'N'S MANUAL. Office of Boating Safety. Dept. of Transportation. U. S. Coast Guard. 400 7th St. S.W. Washington, D. C. 20590. 15 pages. Simple boating safety.

Chan, Gordon L. 1968. NEW PERSPECTIVES IN ELEMENTARY & SECONDARY SCIENCE EDUCATION. College of Marin. Kentfield, CA. 94904.

Chapman, Frank L. 1970. THE SEA AND ITS BOUNDARIES. Carteret County Public Schools. Beaufort, NC. ERIC ED 046 735. 31 p.
This publication is designed for use as part of a curriculum series developed by the Regional Marine Science Project. As an informative text for a three-week unit in marine science for grade eight, it presents a study of coastal processes and oceanography. An ecological approach to nature is emphasized, stressing the ties between culture, economy, and resource use. Topics are divided into three units: Physical Oceanography covers tides; The Sea at Its Boundary discusses waves, beaches, and man's control of the beach environment; and Beyond the Land describes the off-coast profile, elements in the water, winds, currents, and sea testing equipment. Each unit includes a vocabulary, fill-in questions, discussion topics, and activities to complete. Numerous diagrams illustrate topics discussed. This work was prepared under an ESEA Title III contract. A: DAIRE printout.

Chapman, Frank L. 1970. THE SEA AND MODERN MAN. Carteret County Public Schools. Beaufort, NC 28516. ERIC ED 046 737. 25 p.
This publication is designed for use as part of a curriculum series developed by the Regional Marine Science Project. As an informative text for a three-week unit in marine science for grade six, it considers man's role in using coastal resources and how he affects the marine environments. An ecological approach to nature is emphasized, stressing the ties between culture, economy, and resource use. Topics are divided into three units: Food and Recreation, Transportation, and Minerals and Conservation. Each unit includes a vocabulary, fill-in questions, and discussion topics. Numerous diagrams illustrate topics discussed. This work was prepared under an ESEA Title III contract.
A: DAIRE printout.

Chapman, Frank and Will Hou. 1970. TREASURE HUNT: LIFE OF THE SOUND. Regional Marine Science Project, Carteret County Public Schools. Beaufort, NC 28516. 16 p.
This fifth-grade unit takes a look at life on the bottom of an estuary by having samples dredged. Diagrams and vocabulary list also are included. (Title III) Gr. 5. MB.

Charleston County Ocean Science Project. No date. ZONES OF LIFE IN THE SEA. Charleston County Ocean Science Project. ESEA Title III. 27 p.

Clayton, Ron, George.J. Flick and Janice Ford. DISCOVER THE ATLANTIC OCEAN. NOAA Office of Sea Grant, Dept. of Commerce. No date. An exciting coloring book depicting fish & shellfish of Atlantic coast. Scientific names included.

Cole, Mildred. 1953. SEA GULLS. The Grade Teacher, 70 (10): 17; June 1953.
This is a brief teaching unit which considers gulls. Gr. K-6. SB.

Cole, Richard C. 1967. SCIENCE INTERPRETIVE PROGRAM--SPERMACETI COVE INTERPRETIVE CENTER. Middletown Board of Education. Highlands, NJ. ERIC ED 020 898. 11 p.
A field based program for grades 5 and 6 conducted by the Middletown, NJ school system. SB.

Cole, Richard and J. Ronald Gardella. 1968. A HANDFUL OF SAND: A BARRIER BEACH GEOLOGY PROGRAM FOR THE ELEMENTARY SCHOOL. Middletown Board of Education. Highlands, N.J.

Cole, Richard C. and J. Ronald Gardella. OUR WORLD IN A FISHBOWL. Grade 6. Brookdale Community College, County College of Monmouth, Neman Springs Rd, Lincroft, N.J. 07738. 88 pages.
An experiential program in barrier beach ecology...designed to accompany a field activities program for children on the N.J. shore. Materials are applicable to much of the northeastern U.S. coast.

----. No date. "COME WITH ME " SCIENCE SERIES. Science Series Publishing Co. Rte. 1, Box 0180, Shingle Springs, CA. 95682.
Four learning experiences for K-4 on insects, sea animals, dinosaurs or birds. Lessons, songs, tape cassettes, stories.

Constant, Michelle and Kathy Kirkhart. 1971. THE SEA IN SONGS AND STORIES. Science Department of Martin County High School. Stuart, FL. 30 p.
Drawings, descriptions, songs about 10 basic fauna of beach. A fun unit, pleasant, informative. Written by two high school students. Good for elementary field trips to ocean. K-5.

Corcoran, Gerald C. No date. East Beach, Ocean Springs, MS. 39564.
SERIES OF EDUCATION LEAFLETS (9) ELEMENTARY GRADES
SERIES OF EDUCATION LEAFLETS (8) GENERAL PUBLIC
SLIDE SETS OF LOCAL FISHES, INVERTEBRATES, WILDFLOWERS, SNAKES
PLANS OF INSTRUCTION (3) MARINE SCIENCE FOR TEACHERS

Curriculum Research and Development Group. 1975. HAWAII NATURE STUDY PROGRAM FOR ELEMENTARY SCHOOL CHILDREN: PROGRAM MANUAL. Curriculum Research and Development Group, University of Hawaii, University Laboratory School. 1776 University Ave., Honolulu, HI 96822. 34 p.

The Danbury Public Schools and the Eliot Pratt Education Center. 1976-1977. LANGUAGE ARTS AND ENVIRONMENTAL EDUCATION. Grades 5 & 6. Earth Systems Group. P.O. Box 52, Orefield, PA. 18106. 86 pages.
Complete curriculum package designed to combine the disciplines of language arts and environmental education. "First-hand learning experiences in the natural and man-made surroundings were blended with language arts skills such as word attack, vocabulary, comprehension, dictionary, writing and related communication areas."

-----. No date. DAVY JONES' LOCKER. Elementary Education Center. Roanoke, VA. 17 p.

Dudley, Sara. 1969. A DAY WITH DON AT CAPE LOOKOUT SEASHORE. Regional Marine Science Project, Carteret County Public Schools. Beaufort, NC 28516. 32 p.
A third-grade supplementary reader which deals with Cape Lookout National Seashore and the marine life found there. (Title III) Gr. 3. MB.

-----. 1974. ELEMENTARY TEACHERS' RESOURCE MANUAL, LIGHTSHIP CHESAPEAKE, 1973-1974. National Park Service, Department of the Interior. Washington, DC. 72 p.

Environmental Education Center. No date. WHO'S WHO ON THE BEACH. Environmental Education Center. 2264 Second St., Fort Myers, FL 33901.

Environmental Resource Council. 1972. ADVENTURES ON THE BEACH, TEACHER'S GUIDE FOR GRADES K-12. Board of Education, City of New York, New York, NY, 11201. 104 p.
Designed to help teachers use the Atlantic Coast as an outdoor science laboratory. Includes activities for both elementary and secondary level with special sections on investigating living things, sampling equipment and techniques.

Evangelos, Nicholas J. 1973. ENRICHMENT ACTIVITIES IN ENVIRONMENTAL EDUCATION. U. S. Office of Education. ERIC ED 086 490.
A collection of activity units written for elementary teachers. Some of the marine oriented units are useful in locales other than Massachusetts. Available from Merrimack Education Center, Chelmsford, MA. SB.

Fisher, Jeff, and Jane Jones. No date. SPONGES: APARTMENT HOUSES AND WATER PUMPS OF THE SEA. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, Univ. of Florida, Gainesville, FL 32611. 4 p.
Brief description of sponges with sponge study activities and leader's guide.

----. No date. FISHWITCH OR HOW TO BECOME AN ARTIST IN ONE HALF HOUR. Office of CA. Co. Supt. of Schools. 9300 E. Imperial Highway, CA. 90242. One page.
"Guaranteed to overcome the 'But I can't draw...what is this, an art class?' syndrome."

Friend, Anne H. No date. OCEANS: EARTH'S LAST FRONTIER. Henrico County School District. Richmond, VA. 23229. 5 p.
An introductory unit in oceanography for advanced students in grades 4-6.

Gray, Harold H. No date. AN INTRODUCTION TO THE COLLECTION, PRESERVATION, AND IDENTIFICATION OF MARINE ORGANISMS. GRADES 6-9. Regional Academic Marine Program. Kittery, ME. 03904. 32 pages.

Grinstead, F. L. 1971. A MARINE LIFE STUDY CENTER FOR ELEMENTARY SCHOOLS. School Board of the City of Norfolk. Norfolk, VA. 6 p.

Helrich, Jane. No date. WATER ENVIRONMENT--7th & 8th GRADES. Mt. Diablo Unified School District, 1936 Carlotta Drive, Concord, CA. 94521.

Herman, Sharon. No date. The Wetlands Institute, Box 91, Stone Harbor, N.J.
SEASHORE PUZZLES AND GAMES FOR AGES 6-9.
SEASHORE PUZZLES AND GAMES FOR AGES 10 AND UP.

----, No date. HYPOTHERMIA AND COLD WATER SURVIVAL. Instructor's guide. U.S. Coast Guard. 400 7th Street, S.W. Washington, C.C. 20590. Elementary. 26 pages.

----, No date. WATERWORLDS. Sea World of Ohio, 1100 Sea World Drive, Aurora, OH. 44202. "An activity oriented ecological adventure for elementary and intermediate students."

LaFleur, Beth. No date. SOME SEASHORE FRIENDS. Wellesley Curriculum Resource Center. Wellesley, MA. Gr. 1-6.

Marine Science Center. MARINE SCIENCE CURRICULUM- CURRICULA FOR EVERY GRADE LEVEL. Marine Science Center, North Kitsap School District, 215 3rd Ave. South, Poulsbo, WA.

Marine Science Education Center. No date. MARINE SCIENCE: FIRST GRADE. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267. 13 p.
This unit describes stories, transparencies, preserved specimens, classroom activities, student evaluations, suggested reading lists and a bibliography of marine music used in this first grade effort. An attempt is made to develop the concepts that there are many different kinds of marine animals on local beaches, and that there are characteristics common to all of these animals: locomotion, growth, reproduction and the utilization of food and air. Gr. 1. MB.

Marine Science Education Center. No date. MARINE SCIENCE: SECOND GRADE. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267. 27 p.
This unit develops concepts relating to the vastness of the ocean, its depth, its movement and man's dependence upon it for food. A close look is taken at marine animals and plants, their activities and habitats. Preserved specimens and transparencies supplied by the center, classroom activities, student evaluations, a suggested reading list, a bibliography of marine music and diagrams for student art are included. Gr. 2. MB.

Marine Science Education Center. No date. MARINE SCIENCE: THIRD GRADE. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267. 13 p.
This unit develops such concepts as how living things adapt to their environment, the nature of communities, and the grouping of sea animals according to "families." Preserved specimens and transparencies supplied by the Center, classroom activities, student evaluations, suggested reading list, a bibliography of marine music and diagrams for student art work are included. Gr. 3. MB.

Marine Science Education Center. No date. MARINE SCIENCE: FOURTH GRADE. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267. 19 p.
This unit develops an awareness of the oceans of the world with emphasis on the local marine environment. Objectives, classroom activities, student evaluations and many diagrams are included. Gr. 4. MB.

Marine Science Education Center. No date. MARINE SCIENCE: FIFTH GRADE. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267. 22 p.
This unit develops an awareness of oceanography as a relatively new field of science, the resources and plant and animal life of the sea, and the beginnings of food chains. Objectives, classroom activities, student evaluations and many diagrams are included. Gr. 5. MB.

Marine Science Education Center. No date. MARINE SCIENCE: SIXTH GRADE. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267. 68 p.
This unit develops an awareness of oceanography through the topics of tides, waves, currents; chemical properties of seawater; marine biology; and ecology. This two-week unit also includes a large appendix of material resources such as transparencies, vocabulary lists, keys and audio-visual bibliographies. (Title III). Gr. 6. MB.

Maryland Department of Natural Resources. 1978. MARYLAND'S NATURAL RESOURCES COLORING BOOK. Natural Resources Information, Annapolis, MD, 21401. 32 p.

Mastrolia, Lilyan S. No date. ACTIVITIES FOR OCEANOGRAPHY. Barrett Intermediate. 4243 Barrett Rd. Carmichael, CA. 95608. 8th grade. Word find puzzles and activities. 4 pages.

McDonald, Helena. 1953. A FISHING UNIT. The Grade Teacher, 70 (10): 18-19.
This is a unit of instruction about marine fishes. The unit was developed and has been taught in coastal North Carolina. Gr. K-6. SB.

Minardi, Anthony S. and Francesco Bologna, illustrator. 1976. THE WETLANDS. late elementary-junior high. Environmental Art, Box 1338, Easthampton, N.Y. 11937. 48 pages.
A field guide to wild plants of the wetlands with pen and ink detailed drawings.

Nelsen, Jeff. No date. OCEANOGRAPHIC EXPERIMENTS FOR THE ELEMENTARY CLASSROOM. Orange County Department of Education, Publication Sales. 1300-B S. Grand Ave., P. O. Box 11846, Santa Ana, CA 92711. 8 p.
These experiments can be performed using standard kitchen utensils and household items. A: Orange County Dept. of Education.

New Jersey Marine Education Association Quarterly Publication. THE SEA HORSE. k-12.
Bulletin of the N.J. Marine Educ. Assoc. Issued quarterly. Articles on marine educ., techniques, field trips, curriculum. Includes listing of events of interest in the state.

Nixon, Pendleton H. 1972. PEOPLE AND THE SEA. Coastal Resources Center. Univ. of R.I. Marine Bulletin Number 26, Narragansett, R.I. 02882. 7th grade.
"This is an English unit, using the theme of 'Coastal Life' as a focus for language arts activities in reading, writing, listening, and speaking."

Nixon, Pendleton. 1972. PEOPLE AND THE SEA: ADVENTURE AT SEA, A UNIT FOR 8th GRADE ENGLISH CLASSES. 8th grade. Coastal Resources Center, Univ. of R.I. Marine Bulletin No. 27. 55 pages.
"This is an adventure unit using the theme of 'Adventure at Sea' as a focus for language arts activities in reading, writing, and speaking."

Northern New Jersey Conservation Foundation. 1972. EDUCATION FOR SURVIVAL: ECOLOGY IN SCIENCE AND SOCIAL STUDIES, CURRICULUM GUIDE FOR GRADE V. U.S. Office of Education. ERIC ED 066 359.
Grade Five students evaluate their attitudes regarding man and his environment. Units on oceanography are presented in outline form. Available from Northern New Jersey Conservation Foundation, 300 Mendham Road, Morristown, NJ 07960. SB.

Northern New England Marine Education Project. CLAMS AND OTHER CRITTERS. College of Education, University of Maine, Orono, ME, 04473. 33 p.
Interdisciplinary approach to animals with shells for kindergarten and first grade students.

Odell-Fisher, Ellen and Ronald N. Giese. 1978. SENSING THE SEA, GRADES TWO-THREE. Sea Grant Program of the Virginia Institute of Marine Science, Gloucester Point, VA, 23062. 53 p.
Marine education activities with emphasis on involvement: observing, inferring, classifying, problem solving for lower elementary students.

Oxenhorn, Joe. & Goldfeld, Burton. OCEANOGRAPHY AND OUR FUTURE. Elementary-junior high. Globe Book Co., Learning Trends Division, New York, NY.
A basic text in general oceanography for students in upper elementary or junior high school. The text has many diagrams, abundant questions, pictures, and key words. Presented in a manner which is easily understood by students who may have reading or learning difficulties.

----. No date. PARKER RIVER ENVIRONMENTAL PROJECT. Cooperative Extension Service, Univ. of MA., Amherst, MA. 01003. 3 volumes.
Lessons are related to the Parker River Wildlife Refuge; focus on marsh study, mapping, environmental art, plant life, and finally, environmental perception.

Parmer, Carolee. No date. ANIMALS WITH SHELLS- SEASHELLS. Middle elementary-junior high. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences. Univ. of FL. Gainesville, FL.
"Designed to acquaint(students) with the marine life that they would be most likely to see on a trip to the beach."

Outdoor Biology Instructional Strategies (OBIS). No date. OBIS TRIAL EDITION, SET II. OBIS. Lawrence Hall of Science, University of California, Berkeley, CA 94720.
Designed for community-sponsored youth groups and school groups in outdoor settings. Set II includes eight marine activities...

Beach Zonation--Children investigate life zones in the intertidal zone on rocky seashores.
Crawdad Grab--Youngsters build traps to catch crawdads (or crabs) and learn about crawdad behavior and food preferences in the process.
Flocking to Food--Participants assume the roles of birds and use "beaks" to find organisms that a bird might eat.
Hopper Circus--Kids conduct their own side-show investigations of hopping animals and their behavior. For example, how far can a hopper hop? Can hoppers swim?
OBIS Oil Spill--A simulated oil spill is created with popcorn. Participants follow the spill and estimate the impact on the environment.
Rock Pioneers--Place bare rocks in the intertidal zone and check them during subsequent meetings for evidence of colonization by plants and animals.
Seas in Motion--Investigate the movement of water along a beach using water balloons, tennis balls, and marked shells.
Water Breathers--An investigation of aquatic animals and the water currents they create when they move and breathe under water.

Gr. 5-8. A: Dave Buller of OBIS.

Perkins, Karen. No date. MARINE SCIENCE ACTIVITIES PACKET. Orange County Department of Education, Publication Sales, 1300-B S. Grand Ave., P. O. Box 11846, Santa Ana, CA 92711.
Consists of a teacher's guide, bingo game, board game, animal picture cards, word flash cards, and marine animal playing cards. An instruction sheet accompanies the packet along with additional ideas for use in the classroom. A: Orange County Dept. of Education.

Pinous, Howard J. 1970. SECRET OF THE SEA: OCEANOGRAPHY FOR YOUNG SCIENTISTS (with teacher's guide). American Education Publications Unit Books, Xerox. Middletown, CT.

Prescott, Robert, Education Director. 1978. ENVIRONMENTAL SCIENCE PROGRAM FALL 1977-1978. NINE-WEEK CURRICULUM MARINE LIFE. Late elementary-junior high. Cape Cod Museum of Natural History, Inc., Brewster, MA. 02631.

Procopic, Mary A. No date. MASSACHUSETTS FISHERIES. Salem State College, Salem, MA. Department of Natural Resources and the U.S. Department of Commerce National Marine Fisheries Service.
Elementary teacher's guide.

Project COAST.* No date. #101 ANIMALS WITH SHELLS. 4 p.
The student activities suggested in this unit will enable the child to recognize different animal shell types and to understand why the shell is important to the animal. A bibliography of books, film loops, and records is also provided. Has a language arts supplement. Gr. K.

Project COAST.* No date. #116 ART AND THE MARINE ENVIRONMENT. 31 p.
This unit suggest 25 arts and crafts activities related to the marine environment. Making shell jewelry, shell wind chimes, driftwood sculptures, sand castings, sand lanterns, fish prints, feather and beach grass wreaths, and pressed vegetation collages are just some of the projects suggested. A bibliography and list of basic materials are also provided. Gr. K-6.

Project COAST.* No date. #102 CAPE HENLOPEN--A WEEKEND OR TWO-DAY TRIP. 18 p.
This unit contains a list of procedures and materials to be used in organizing activities to be done before, during, and after a field trip to the beach. Activities include beachcombing, hunting for ghost crabs, digging for clams, and setting up and maintaining a marine aquarium. A list of activities to do during the bus ride, a bibliography, and diagrams of shore life and the anatomy of a clam are also included. Has a language arts supplement. Gr. K-4.

Project COAST.* No date. #103 THE "COMPLETE" SEASIDE NATURE TRAIL. 19 p.
This lesson, based on the Seaside Nature Trail at Cape Henlopen State Park, Lewes, Delaware, is divided into four sections: life in the intertidal zone; plant life on the barrier beach and sand dune; animal life in the dune area; and the Seaside Nature Trail. The first three sections deal with plant and animal life and their adaptations to the particular environment. The last section is an outline of procedures and materials needed on the Seaside Nature Trail. The illustrations of dune features, dune plants, dune insects, dune wildlife, and life along the shore can be used either as transparencies or handouts. Has a language arts supplement. Gr. K-4.

Project COAST.* No date. #233 DO YOU BELIEVE IN GHOST CRABS? 17 p., 2 slides.
This unit suggests activities to do before, during, and after a field trip to hunt for ghost crabs. Four student readings provide background about the ghost crab's physical appearance, habitat, life cycle, and daily behavioral patterns. Student worksheets, transparency/handout masters, pre- and post-tests, discussion questions, and a list of creative activities are also included. Gr. 6.

Project COAST.* No date. #107 THE DUNES AT PLAY. 10 p., 4 slides.
Students use creative dramatics to learn about sand dunes. Teacher background includes information on sand dunes as well as instructions on how to use creative dramatics in teaching. A play about the formation, movement, and stabilization of sand dunes is provided. Also included are pre- and post-tests and an illustration of sand dunes. Has a language arts supplement. Gr. 1-3.

Project COAST.* No date. #114 EXPLORING A POND. 7 p.
The conservation of water bodies and the associated animal life is the focus of this learning experience. Five major student activities are suggested: introduction to the topic via films and filmstrips; student reports and booklets on animal life in nearby ponds; a field trip to a pond to collect samples; microscopic study of a pond sample; and creative construction of pond-scene models with animal inhabitants. A test with an answer key, a suggested materials list, and a teacher-student reference list are also provided. Has a language arts supplement. Gr. 3-4.

Project COAST.* No date. #111 THE HORSESHOE CRAB. 14 p.
Two poems introduce the evolutionary and ecological significance of the horseshoe crab. An outline then describes the physical appearance, life cycle, history, and economic and ecological value of the animal. This lesson is supplemented by five transparency/handout masters. Has a language arts supplement. Gr. 3-6.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Project COAST.* No date. #5 LANGUAGE ARTS ACTIVITIES TO SUPPLEMENT COAST LEARNING EXPERIENCES. 40 p.
This unit consists of: (1) a list of the language arts supplements that have been added to 26 COAST learning experiences; (2) language arts activities; and (3) an annotated list of children's books about the marine environment and suggestions for using them in the classroom. Language arts activities include vocabulary exercises, ecology and conservation scrapbooks, and a scramble board. Exercises for using the children's marine environment books include comparing the contrasting components of fiction and developing criteria for judging information books, fiction, historical fiction, biography, and poetry. (The COAST learning experiences that have language arts supplements are noted on this inventory with the phrase "has a language arts supplement." The supplements consist of specific activities to enrich each unit and/or suggested book lists for students.) Gr. K-6.

Project COAST.* No date. #108 THE MUSKRAT. 13 p.
The muskrat's habitat and life style are presented with the aid of class discussion, a field trip and follow-up activities. Teacher background information, pre- and post-tests, a bibliography, and three illustrations of the muskrat and its burrow are included. Has a language arts supplement. Gr. 2-4.

Project COAST.* No date. #109 THE NOT-SO-COMMON OYSTER. 35 p.
An independent study packet comprises the first part of this unit. It contains a pre-test, an enjoyable and informative story on the oyster, reading and vocabulary exercises, a post-test, and activity suggestions. The second section is a teacher packet which describes the independent study packet and supplies additional material for lessons in reading, vocabulary development, spelling, mathematics, art, and language arts. Also included are transparency/handout masters of the anatomy of an oyster, word lists, and a crossword puzzle. Has a language arts supplement. Gr. 3-5.

Project COAST.* No date. #105 SHIPS AND SEAWAYS. 25 p., 17 slides.
This unit consists of seven parts: the first six parts describe different types of ships, the last part discusses navigational rules. Thirteen transparency/handout masters and seventeen slides provide illustrations of tankers, cargo ships, harbor boats, ferry boats and others. The lesson is designed to be either teacher-directed or self-taught, depending on the grade level of the class. A list of activities suggests ways to combine the student's imagination with the knowledge gained from the lesson. Has a language arts supplement. Gr. K-5.

Project COAST.* No date. #110 SHIPS THROUGH THE AGES. 20 p.
Ships Through the Ages explores the history of marine transportation from primitive man's log boats to the clipper ships of the 1800's. Eight transparency/handout masters and a quiz are provided, as well as suggestions for student activities in music, poetry, drama, history, social studies, and science. Has a language arts supplement. Gr. 3-6.

Project COAST.* No date. #106 TEACHER'S GUIDE TO PAGOO. 30 p., 17 slides.
Pagoo is the story of a hermit crab in a tidal pool, written by Holling Clancy Holling. This guide consists of twenty lessons, one for each chapter of the book. The purpose is to introduce students to the biology of a tidal pool. Each lesson has instructional procedures, a list of materials to be used, and vocabulary and facts to be discovered. Seventeen slides and sixteen transparency/handout masters illustrate many different marine organisms. Instructions for setting up and maintaining a marine aquarium are included. The book Pagoo is published by Houghton Mifflin Company. Has a language arts supplement. Gr. K-6.

Project COAST.* No date. #112 USEFUL PLANTS OF THE SEA. 10 p., 6 slides.
A student worksheet is used with an article from Ranger Rick's Nature Magazine which describes the sources, types and uses of seaweed. The teacher's guide gives ideas for student discussion, answers to the worksheet, and a description of the six slides. Has a language arts supplement. Gr. 4-5.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Project COAST.* No date. #115 WATER. THE COMMON WASTE RECIPIENT. 8 p.
This learning experience is a directed reading activity based on material reproduced from "Water and Life" in Ranger Rick's Nature Magazine, 4(8), 1970. The objectives are to acquaint students with water usage, sewage treatment, conservation practices, and vocabulary related to water consumption. Follow-up activities and diagrams and cartoons which can be used as handouts or transparencies are also included.
Has a language arts supplement. Gr. 4-5.

Project COAST.* No date. #104 WATER FOR FUN. 8 p.
The recreational uses of water and the manner in which pollutants affect these activities are investigated. The unit involves activities such as viewing and naming waterways on maps, learning how they are used and what pollutes them, and making and labeling maps.
Has a language arts supplement. Gr. K-4.

Qualey, Barbara. No date. UNIT FOR FIFTH GRADE. Fisher School. Gould St., Walpole, MA 02081.
Endangered species.

Rabinowitz, Alan, et al. 1970. OCEANOGRAPHY: AN ENVIRONMENTAL APPROACH TO MARINE SCIENCE. U. S. Office of Education. ERIC ED 045 430.
The teachers' guide provides materials for a full year course. This is an environmental approach which emphasizes the interdisciplinary nature of the ocean sciences. SB.

Radford Career Education Program. No date. ELEMENTARY EDUCATION UNITS: GRADE 1. Radford Career Education Program. Radford, VA. 93 p.

Raimist, Roger J. 1970. MARINE SCIENCE SOURCEBOOK, FIRST EDITION. U. S. Office of Education. ERIC ED 037 340.
This manual was prepared for a teacher workshop in marine science education. Provided are methods of collecting marine specimens, methods of preparing shell collections as well as an annotated bibliography. SB.

Rasmussen, Frederick A. 1978. COASTAL AWARENESS: A RESOURCE GUIDE FOR ELEMENTARY SCIENCE. Nat'l Oceanic and Atmospheric Admin. Office of Coastal Zone Management. Washington, D.C. 84 pages.

Richeson, Karren and Janey Knaack. 1972. INTERDISCIPLINARY OUTDOOR EDUCATION: SEA AND SHORE. U. S. Office of Education. ERIC ED 061 034. 41 p.
This teachers' resource guide contains 24 classroom activities for use primarily in K-3 grades, most of which involve observing and discussing various kinds of sea life found at the seashore. Instructor background information is provided with each activity. Gr. K-3. SB.

Sabin, Francene. 1969. EXPLORING THE WORLD AROUND US. American Education, 5 (6); 12-17.

Santana, Henry. 1968. ELEMENTARY MARINE SCIENCE HANDBOOK. Living Materials Center, Corpus Christi Independent School District. 515 N. Caracahua, P. O. Drawer 10, Corpus Christi, TX 78403. 97 p.
This handbook provides the elementary teacher with a general background to local marine flora and fauna, marine organisms in the classroom, field trips and a bibliography of books, pamphlets and bulletins, plus many diagrams. (Title III) Gr. K-6. MB.

Saunders, Agnes. No date. 4-H. MARINE BIOLOGY. Cooperative Extension Agent, Nassau Co. 381 Sunrise Hwy. Lynbrook, N.Y. 11563. 14 pages.

Scarff, Judith M. 1970. A TOUR OF MUDFLAT TOWN. U. S. Office of Education. ERIC ED 055 834.
The text serves as a supplementary second grade reading text. It describes waves, animals, algae, salinity, etc. Gr. 2. SB.

----------. No date. THE SEA WORLD. Elementary Education Center, Fredericksburg, VA. 57 p.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

——. 1973. THE SKIPPER'S COURSE. U.S. Coast Guard, 400 7th St. S.W., Washington, D.C. 20590. 94 pages. Advanced boating safety.

Sullivan, Vincent P. & Eliz. Lawrence. 1971. THE ENVIRONMENT AS AN EXPANDED CLASSROOM. Coddington St., Quincy, MA. 02169. 57 pages.

Trotter, Margo. No date. TURTLE UNIT. New England Aquarium. Central Wharf, Boston, MA 02110. Gr. 1-6.
Teachers' guide.

Vaiuso, Frank. 1970. THE SEA, AN INTERDISCIPLINARY APPROACH TO MARINE SCIENCE FOR ELEMENTARY SCHOOL CHILDREN. Space Science Learning Program. Newport-Mesa Unified School District, 1601 16th St., Newport Beach, CA 92660. U. S. Office of Education. ERIC ED 045 375. 20 p.
This teachers' guide develops an interdisciplinary approach to marine science. The lessons are concerned with food chains, interdependencies, physical characteristics, comparative dissections, and student involvement in political issues dealing with water and air pollution. For each activity, suggestions are provided regarding objectives, materials needed, procedures, evaluations and follow-up. MB.

Waters, Barbara S. OCEAN IN YOUR CLASSROOM--ELEMENTARY LEVEL (K-8). Parts I-V. Cape Cod Extension Service, Railroad Avenue, Barnstable, MA, 02630.
Tips for setting up and maintaining salt-water aquariums in the classroom.

Waters, Barbara S. No date. PROJECT BEACHCOMBER: PARTS I-IV. Massachusetts Extension Service, Cape Cod Extension, 4-H. Railroad Ave., Barnstable, MA 02630.

Watling, Carol and Raymond Hallard. THE SEA BESIDE US. Teaching the Exceptional Child, 7 (1): 26-8; Fall 1974.
Children with learning problems take a trip to the shore. They use picture keys to identify organisms. SB.

White, Mal. NORTH AMERICAN SEALIFE COLORING ALBUM. Wildlife Series. 1973. Troubador Press, San Francisco. Paperback. Grades 1-6. A sophisticated coloring book with excellent illustrations.

SECONDARY LEVEL

BIOLOGICAL OCEANOGRAPHY

----. 1977. ABSTRACTS OF MARITIME EDUCATION AND TRAINING PUBLICATIONS. Maritime Administration, U.S. Dept. of Commerce, Washington, D.C.

Alameda County School Department. 1971. HANDBOOK OF TECHNIQUES AND GUIDES FOR THE STUDY OF THE SAN FRANCISCO BAY-DELTA-ESTUARY COMPLEX, PART 4. KEY TO THE COASTAL MARINE FISHES OF CALIFORNIA. Alameda County School Department, Hayward, CA. Contra Costa County Department of Education. Pleasant Hill, CA. 29 p.

Alameda County School Department. 1974. TEACHER'S SUPPLEMENT TO GUIDE TO MARINE ECOLOGY RESEARCH...A CURRICULUM FOR SECONDARY STUDENTS. Grades 9-12. Contra Costa County Supt. of School Office. 75 Santa Barbara Rd. Pleasant Hill, CA. 94523. 115 pages.

Andersen, Ruth. 1972. LIFE ON THE TIDAL MUDFLATS: ELKHORN SLOUGH. Monterey County Office of Education. Salinas, CA. U. S. Office of Education. ERIC ED 073 946. 29 p.
Life in an estuarian environment is studied using audio-visual materials. Available from Monterey County Office of Education, Instructional Media Division, P. O. Box 851, Salinas, CA 93901. SB.

Awkerman, Gary L. 1973. ANIMALS OF THE SEA: COELENTERATES, PROTOZOA, AND SPONGES. Charleston County School District, North Charleston, SC. U. S. Office of Education. ERIC ED 086 552. 82 p.
Units covering coelenterates, protozoa and sponges. Designed to be used with standard curricula. SB.

Awkerman, Gary L. 1973. ASPECTS OF MARINE ECOLOGY. Charleston County School District. North Charleston, SC. U. S. Office of Education. ERIC ED 086 553. 55 p.
Designed for use in a standard curriculum. The study guide covers food webs and chains, describes functions of producers and consumers and discusses pollution. SB.

Awkerman, Gary L. 1973. MARINE BIOLOGICAL FIELD TECHNIQUES. Charleston County Ocean Science Project. ESEA Title III. U. S. Office of Education. ERIC ED 086 555. 24 p.
A guide to various field techniques, the document is designed for inclusion in a standard curriculum. SB.

Bane, Gilbert and Anneka Lawson. 1969. MARINE PLANKTON PRIMER. Martek Instruments, Inc. 879 W. 16th St., Newport Beach, CA 92660. 10 p.
This introduction to plankton, prepared for teachers and students, includes classification, nutritional relationships, distribution, collection methods, analysis of samples and suggested additional reading material. Diagrams of many genera are included. MB.

Barnes, W. J. P., et al. 1969. COROPHIUM VOLUTATOR--AN INTERTIDAL CRUSTACEAN USEFUL FOR TEACHING IN SCHOOLS AND UNIVERSITIES. Journal of Biological Education, 3: 283-98.
The article describes collection procedures, procedures necessary to maintaining the organism, observations of behavior. Included are experiments in the areas of substrate selection, light reactions, population analysis, and movements in and out of water. SB.

Barton, Jackie. 1977. MARINE ECOLOGY, A MINICOURSE. 6017 Cherryhill, Houston, TX 77087.
Available by writing to J. Barton. Prepared along individualized self-paced lines and developed in accordance with methods and objectives set forth in the Texas Science Framework (draft), Texas Ed. Agency, Austin, TX. Sept. 1975. Gr. 10-12. A: Jackie Barton.

Barton, Jackie. 1977. POND ECOLOGY, A MINICOURSE. 6017 Cherryhill, Houston, TX 77087.
Available by writing to J. Barton. Prepared along individualized self-paced lines and developed in accordance with methods and objectives set forth in the Texas Science Framework (draft), Texas Ed. Agency, Austin, TX. Sept. 1975. Gr. 10-12. A: Jackie Barton.

Barton, Jackie. 1977. SALTWATER AQUARIUMS AS A HOBBY, A MINICOURSE. 6017 Cherryhill, Houston, TX 77087.
Available by writing to J. Barton. Prepared along individualized self-paced lines and developed in accordance with methods and objectives set forth in the Texas Science Framework (draft), Texas Ed. Agency, Austin, TX. Sept. 1975. Gr. 10-12. A: Jackie Barton.

Beard, Wendy. THE MOLLUSC AND ITS HOME. The Wetlands Institute, Box 91, Stone Harbor, N.J.

Bennett, Lloyd M. 1966. A MARINE ECOLOGY UNIT FOR SEVENTH GRADE. American Biology Teacher, 28 (1): 43-50.
The article provides an overview of a unit of instruction. The author points out that students and teachers can handle this material with enthusiasm. SB.

Bergen, Robert A. No date. ECOLOGY OF A CYPRESS SWAMP: FIELD OBSERVATIONS. Florida Atlantic U., Pine Jog Environmental Sciences Center. 6301 Summit Blvd., West Palm Beach, FL 33406.

Bergen, Robert A. No date. ECOLOGY OF A CYPRESS SWAMP: INTERPRETING YOUR DATA. Florida Atlantic University, Pine Jog Environmental Sciences Center. 6301 Summit Blvd., West Palm Beach, FL 33406.

Bergen, Robert A. No date. ENERGY FLOW IN AN ESTUARY. Florida Atlantic University, Pine Jog Environmental Sciences Center. 6301 Summit Blvd., West Palm Beach, FL 33406.

Bergen, Robert A. No date. ENERGY FLOW IN AN ESTUARY, PART II. Florida Atlantic University, Pine Jog Environmental Sciences Center. 6301 Summit Blvd., West Palm Beach, FL 33406.

Boubjerg, Richard V., and Peter W. Glynn. 1960. A CLASS EXERCISE ON A MARINE MICROCOSM. Ecology, 41: 229-32.
A description of a class activity in which community structure and community dynamics such as standing crop, etc., are measured. SB.

Brevard County School Board. 1974. MAN'S IMPACT ON THE ENVIRONMENT: THE ESTUARY AS AN ECOSYSTEM. Brevard County Dept. of Education. Cocoa, FL. 79 p. U. S. Office of Education. ERIC ED 106 077.
The guide focuses on the estuary as an ecosystem. SB.

Bridges, Wm. 1970. THE NEW YORK AQUARIUM BOOK OF THE WATER WORLD. Grades 7 and up. New York Zoological Society, American Heritage Press, N.Y. 287 pages.
A guide to representative fishes, aquatic invertebrates, reptiles, birds, and mammals.

Bryan, R. C. 1974. CAMPUS ECOLOGY. Science Activities, 11 (3): 29-31.
A method of using those things found on campus or around school in science instruction. SB.

Career Orientation Utilizing Language Development (Project COULD). 1974. FISHING ECOLOGY. Project COULD, Coos County Intermediate Education District. 2405 Colorado St., North Bend, OR 97459. ERIC ED 120 497. 54 p.
The five-week unit on fishing ecology focuses on environment protection methods, fishing management vocabulary, jobs, and economic influences. It is divided into eight sections: (1) a summary; (2) a unit outline; (3) project goals; (4) unit performance objectives; (5) vocabulary; (6) suggested learning activities (games, puzzles, and evaluation and follow-up activities); (7) lists of resource persons and materials (audio-visual and print media) and outlines for use by the resource person (suggestions, discussion topics, and related vocabulary); and (8) background information (suggested teacher reading and job descriptions for aquatic and management biologists, marine extension agent, and experimental biological technician). Gr. 7.

Carefoot, Thomas. 1977. PACIFIC SEASHORE: A GUIDE TO INTERTIDAL ECOLOGY. J.J. Douglas Ltd. 1875 Welch St. North Vancouver, British Columbia. 203 pages.

Carothers, Pat W. No date. PLANKTON OF THE ST. JOHN'S RIVER. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267.

Carothers, Pat W. and Gary G. Kirkland. No date. MARINE BIOLOGY, GRADE TEN. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267.
This unit deals with major habitats and population groups of the ocean, collection techniques used by marine biologists, microscopic study and identification of common plankton, estuarine organisms, adaptation of marine organisms to their environments, importance of estuaries and marshes to the ocean and effects of pollution on life in the sea. Unit lasts 12 days and consists of six lessons. Vocabulary worksheets, marine specimen kit and identification sheet, keys, plankton identification manual, transparencies and a suggested reading list for students and teacher are also included. Gr. 10. MB.

Carothers, Pat W., and Marilynn G. Heaney. No date. MARINE BIOLOGY GRADE 7. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267. 74 p.
Eight lessons (marine habitats, marine population, scientific drawing, plankton, taxonomy and classification of major marine phyla, marine ecology, marshes and estuaries, pollution) are included. Keys to worksheets, marine specimen kit and guide, transparencies, suggested reading list, key to major marine phyla, and plankton identification manual are also provided for this course in marine biology. Gr. 7. MB.

Castellani, Marylynn, ed. 1974. GUIDE TO MARINE ECOLOGY RESEARCH... A CURRICULUM FOR SECONDARY STUDENTS. Contra Costa County Superintendent of Schools. Pleasant Hill, CA. 150 p.

Castellani, Marylynn L., ed. 1974. GUIDE TO MARINE ECOLOGY RESEARCH... A CURRICULUM FOR SECONDARY STUDENTS (TEACHER'S SUPPLEMENT). Contra Costa County Superintendent of Schools Office. 75 Santa Barbara Rd., Pleasant Hill, CA 94523. 115 p.

Contra Costa County Department of Education. 1974. MARINE ECOLOGY RESEARCH RESOURCE UNITS. U. S. Office of Education. ERIC ED 106 088.
This is an ecological unit designed to involve secondary students in the study of the marine biome. Gr. 7-9. SB.

Crane, Jules M., Jr. 1973. INTRODUCTION TO MARINE BIOLOGY. Grades 9-12. Merrill.
Excellent labs with text enough for course background. Illustrations.

Cultrera, Sebastian J. 1970. INTRODUCTION TO ECHINODERMS. Regional Academic Marine Program. Kittery, ME 03904. 27 p.
This text presents information on the starfish, sea urchin, sand dollar and sea cucumber; laboratory experiences on each; fill-in questions to answer; and a bibliography. (Title III). Gr. 7-12. MB.

Cultrera, Sebastian J. No date. LET'S BUILD AN OCEAN. Regional Academic Marine Program. Kittery, ME 03904. 14 p.
This sixth-grade unit on building an aquarium and preparing it for marine life also discusses salinity, temperature, aeration, carbon dioxide, oxygen exchange and filtration. (Title III). Gr. 6. MB.

Davis, Hubert J. No date. MARINE LIFE AND THE SEA. Portsmouth Public Schools. Portsmouth, VA. 36 p.

DeSanto, Robert S. and Jerome P. Harkins. 1970. THE DESIGN AND DEVELOPMENT OF A HIGH SCHOOL PROGRAM IN MARINE BIOLOGY AND ECOLOGY. Biomarine Associates. 7 N. MacQuesten Parkway, Mount Vernon, NY 10550.
This prospectus describes the development and testing of a self-contained, process-oriented, instructional system which can be readily integrated into any typical high school biology course. Textual material, curriculum guide, and guide to flora and fauna of coastal areas are being prepared. The entire program will be packaged in units adequate for one instructor and 10-12 students. (This program is based on Marine Explorations, a college course given at Connecticut College.) Gr. 9-12. MB.

Dewees, Christopher M. and Jon K. Hooper. 1975. BIOLOGICAL OCEANOGRAPHY. Sea Grant Marine Advisory Publ. 2255. Univ. of Cal., Div. of Ag. Serv., Berkeley, CA. 94720. 5 p.
Introduction to food webs, ocean ecology, marine life, with diagrams and glossary.

Dewees, Christopher M. and Jon K. Hooper, 1975. ECOLOGY OF THE INTERTIDAL ZONE. Sea Grant Marine Advisory Publ. 2246. Univ. of Cal., Div. of Ag. Serv., Berkeley, CA. 94720. 4 p.
Diagrams and information on adaptation, zonation. Includes glossary.

Dewees, Christopher M. and Jon K. Hooper. 1975. MARINE MAMMALS. Sea Grant Marine Advisory Publ. 2274. Univ. of Cal. Div. of Ag. Serv., Berkeley, CA. 94720. 7 p.
Illustrations and descriptions of cetaceans, pinnipeds, and sea otters. Includes glossary.

Dewees, Christopher M. and Jon K. Hooper. 1976. SAMPLING PLANKTON. Sea Grant Marine Advisory Publ. 2557. Univ. of Cal., Div. of Ag. Serv., Berkeley, CA. 94720. 2 p.
Instructions for making a simple plankton net and diagrams of some common marine plankton.

Diehl, Fred A., et al. 1971. EXPERIMENTS USING MARINE ANIMALS. Aquarium Systems, Inc., Eastlake, OH. 44094. 92 p.

Drabek, Constance. No date. DIAGRAMS OF SEA-LIFE. Mattakeese Middle School. W. Yarmouth, MA. 16 p.

Gaito, Brad. No date. ECOLOGY. Bethpage High School, Bethpage, NY.

Gammiach, Susan C. and James A. Lanier. 1979. THE MARINE EDUCATION MATERIALS SYSTEM (MEMS) GUIDEBOOK. Virginia Institute of Marine Science, Gloucester Point, VA 23062.
Complete guide to the use of MEMS for collection, storage, retrieval and dissemination of marine education materials. Contains a list of the publications available, an index of descriptors for retrieving articles by subject, instructions for doing a manual cross-referenced search of MEMS and address of distributors throughout the country.

Gordon, Bernard L. 1970. MAN AND THE SEA: CLASSIC ACCOUNTS OF MARINE EXPLORATIONS. Natural History Press, New York. 498 p.

Gordon, Bernard L. 1974. MARINE CAREERS: SELECTED PAPERS. Edited by Gordon. The Book & Tackle Shop. Watch Hill, RI. 42 p.

Gordon, Bernard L. 1974. THE MARINE FISHES OF RHODE ISLAND. A guidebook, photos by author. 135 p.

Gray, Harold H. No date. THE COLLECTION AND PRESERVATION OF MARINE ALGAE. Regional Academic Marine Program. Kittery, ME 03904. 27 p.
Presents methods, materials and techniques for collecting and preserving marine algae, specially designed for student use. Two appendices, construction of plant presses and of plant storage cabinets, and an annotated bibliography are included. (Title III). Gr. 7-12. MB.

Gray, Harold H. No date. THE COLLECTION AND PRESERVATION OF MARINE INVERTEBRATES. Regional Academic Marine Program. Kittery, ME 03904. 30 p.
This publication has been prepared for the student who has a serious interest in marine biology. It is not intended for general classroom use. Topics discussed are planning collections, collecting procedures, preservation, culturing, and some special collecting methods. (Title III). Gr. 7-12. MB.

Gray, Harold H. No date. IDENTIFICATION OF MARINE ORGANISMS. Regional Academic Marine Program. Kittery, ME 03904. 19 p.
Presents methods and materials involved in the identification of marine organisms. Field guides, keys and a large annotated reference section are included. (Title III). Gr. 7-12. MB.

Gray, Harol H. and Sebastian J. Cultrera. No date. SEASONAL VARIATIONS IN TIDEPOOLS. Regional Academic Marine Program, Kittery, ME. 03904. 21 pages.

Harkins, Jerome P. 1971-72. MARINE ECOLOGY PROGRAMS. Biomarine Associates. 7 N. MacQuesten Pkwy., Mount Vernon, NY 10550.
This brochure describes the series of courses, Marine Explorations I-IV, ranging from 15 to 240 hours in length, involving students of all ages in first-hand experiences with the ecology of different salt-water environments. Each course consists of carefully-designed field trips, laboratory exercises, classroom lectures and demonstrations. The programs have evolved over a period of 10 years and have been given successfully in many different localities. Gr. K-12. MB.

Helrich, Jane. 1971. HANDBOOK OF TECHNIQUES AND GUIDES FOR THE STUDY OF THE SAN FRANCISCO BAY DELTA-ESTUARY COMPLEX, PART 2. KEY TO THE PHYTOPLANKTON PHYLA AND GENERA. U. S. Office of Education. ERIC ED 086 483.
A guide for identification of the phytoplankton phyla and genera of the bay area. SB.

Herron, Richard R. 1969. ENRICHMENT OF THE INVERTEBRATE STUDY IN THE LIFE SCIENCE CURRICULUM. Masters thesis, University of Utah. Salt Lake City, UT.

Johnson, Mark. No date. TIDEPOOL GUIDE. Orange County Onshore Laboratory. Orange County Department of Education. Santa Ana, CA. 8 p.
A tidepool guide to animals of Southern California. A: Orange Co.

Kimsey, J. B. and Leonard O. Fisk. 1960. HANDBOOK OF TECHNIQUES AND GUIDES FOR THE STUDY OF THE SAN FRANCISCO BAY-DELTA-ESTUARY COMPLEX, PART 5. KEYS TO THE FRESHWATER AND ANADROMOUS FISHES OF CALIFORNIA. Alameda County School Dept., Hayward, CA. Contra Costa County Dept. of Education, Pleasant Hill, CA.

Lavene, Shirley. 1970. LABORATORY EXERCISES IN MARINE SCIENCE. Science Department, Martin County High School. Stuart, FL 33494.
A collection of laboratory exercises written by marine science students during 1967-1969. Each student was asked to produce at least one "new" exercise. Some topics were algae growth, the clam, the bivalve, plumed worm, hermit crab, stone crab, horseshoe crab, sea urchin, vertebrate and invertebrate eye and spiny dogfish shark. Bibliographies of each study are included. MB.

Lloyd, Roger M., Jr. 1975. MARINE BIOLOGY FIELD LABORATORY MANUAL. Kendall/Hunt Pub. Co. Manual for introduction to marine biology. Development field and laboratory survey of the marine fauna and flora. A: R. M. Lloyd.

Lucchesi, Linda. No date. THE BLUE CRAB- CALLINECTES SAPIDUS. The Wetlands Institute, Box 91, Stone Harbor, N.J.

----------. 1969. THE MAJOR COASTAL COMMUNITIES OF NORTH CAROLINA. Marine Science Project, Beaufort, NC. 29 p. ERIC ED 020 829.

Maine Dept. of Sea & Shore Fisheries. 1963-69. FISHERIES EDUCATION SERIES. Maine Department of Education. Kittery, ME 03904.
The purpose of these units for elementary and secondary students is to develop an understanding of marine research and an acquaintance with the problems affecting conditions and economic status of the coastal commercial shellfish and other fisheries of Maine. There are ten units which cover the following: soft-shelled clam, scallop, alewife, sea herring, smelt, ocean perch, lobster, marine plants and algae and northern shrimp. Each unit has detailed information, anatomical diagrams, questions and answers, and classroom activities on each specimen, all appropriate for the grades listed. Gr. K-12. MB.

Marine Ecology Research. No date. SURVEYING PELAGIC POPULATIONS WITH A BEACH SEINE AND SURVEYING MUD FLATS OR SANDY BEACH POPULATION. Contra Costa County Schools. 75 Santa Barbara Rd., Pleasant Hill, CA 94523.

Marine Technology Society. 1977. PUBLICATION LIST 1977. 1730 M. Street, N.W. Washington, D.C. 20036.

Maynard, Sherwood. 1978. SELECTED READINGS IN HAWAIIAN MARINE SCIENCE. Department of Oceanography, University of Hawaii.

McAnich, Helen. No date. ECOLOGY OF AN ESTUARY. Field Station Unit for the Jupiter Inlet Marine Science Center. Palm Beach County (FL) Schools.

McAnich, Helen. No date. MARINE MOLLUSKS AND PLANKTON, NEKTON AND BENTHOS. Field Station Unit for the Jupiter Inlet Marine Science Center. Palm Beach County (FL) Schools.

Moody, John. No date. BENTHIC STUDIES. Falmouth Public Schools, Falmouth, MA.

Mt. Dora High School. No date. CNIDARIA. Module MS-4. Mt. Dora, FL.

Mt. Dora High School. No date. OYSTER BAR FIELD TRIP. Mt. Dora, FL.

Mt. Dora High School. No date. SPONGES: PHYLUM PORIFERA. Module MS-3. Mt. Dora, FL.

National Oceanic and Atmospheric Administration. No date. MOTION PICTURE FILMS. U.S. Dept. of Commerce, N.O.A.A., Rockville, MD.

National Oceanographic Data Center. FILM LIST. U. S. Dept. of Commerce, N.O.D.C., Washington, D.C.

National Oceanographic Data Center. No date. MARINE SCIENCE NEWSLETTERS, 1975 - AN ANNOTATED BIBLIOGRAPHY. U. S. Dept. of Commerce, N.O.D.C., Washington, D.C.

New York Aquarium Education Department. No date. A number of marine-related materials are offered, including:
GENERAL AQUATIC BIBLIOGRAPHY
A 13-PAGE PROGRAM TO BE USED IN DEVELOPING LESSON PLANS ASSOCIATED WITH STUDENTS' LEARNING EXPERIENCES AT THE AQUARIUM.
A 6-PAGE PAMPHLET ON THE FISH: Explores the anatomy of fish, directions for dissection, and directions on how to make a fish print.
New York Aquarium Education Dept., Boardwalk & West 8th Street, Brooklyn, New York, 11224.

New York City Board of Education. No date. MARINE BIOLOGY FOR THE HIGH SCHOOL. Bureau of Curriculum Development. 131 Livingston St., Brooklyn, NY 11201.

Nova Scotia Museum. No date. INFORMATION ON MUSEUM RESOURCES FOR SCHOOL OCEANOGRAPHY. Education Section, 1747 Summer St., Halifax, N.S.

Oceanography Unlimited. 1970. OCEANOGRAPHY: AN ENVIRONMENTAL APPROACH TO MARINE SCIENCE. Oceanography Unlimited. Paterson, NJ
Contains lab experiments, exercises and basic marine information. Subjects covered are an overview of the ocean environment, collecting and preserving marine organisms. Marine bacteriology, plankton and various marine invertebrate phyla are covered in detail.

Osner, Richard F. 1964. A SUMMER MARINE BIOLOGY SEMINAR FOR U. S. FIFTH AIR FORCE HIGH SCHOOL STUDENTS. American Biology Teacher, 26 (1): 40-2.
Discusses a program, field trips, etc., for a summer program. Students were required to have a 3.0 average in order to get into the program. Gr. 9-12. SB.

Parmer, Carolee. for the following, write to: Florida Cooperative Extension Service Institute of Food and Agriculture Sciences, Univ. of Florida at Gainesville, Florida.
EXPLORING BEACH SAND. No date. 4 pages plus Leader's Guide.
Examination of beach sand; what it is like and what it will do. Step-by-step activity suggestions to enhance the observer's understanding of the qualities of sand.
FLORIDA'S SANDY BEACHES. No date. Grades 9-12. (plus Leader's Guide) 4 pages.
Designed to give a better understanding of a typical sandy beach. Terminology associated with topic provided.
OCEAN-GOING PLANTS—SEAWEED. No date. Grades 9-12. 4 pages & Leader's Guide.
Introduces the student to information concerning seaweed and makes him aware of the commercial uses of seaweed.
PHYTOPLANKTON- THE OCEAN'S WANDERING PLANTS. No date. Grades 10-12. 4 pages & L.G.
An examination via illustrations of the different kinds of phytoplankton found in the ocean, with emphasis on the fact that all sea life ultimately depends on plankton.
PLANKTON - THE BASIS OF LIFE. No date. Grades 9-12. 4 pages & L.G.
Designed to "introduce ... plankton, and to develop (an) awareness of plankton as the 'vital link' in the ocean community."
THE RETURN OF THE GREEN TURTLE. No date. Grades 9-12. 4 pages & L.G.
Information "about sea-turtles in general and the green turtle in particular, and their presence on the Florida beaches."
SHARK FACTS. No date. Grades 9-12. 6 pages & Leader's Guide.
Explores the shark, its anatomy and eating habits, as well as the likelihood of and reasons for attacks.
ZOOPLANKTON - THE OCEAN'S WANDERING ANIMALS. No date. Grades 10-12. 4 pages & Leader's Guide. Introduces the different kinds of animal plankton.

Pequegnat, Willis E. 1961. NEW WORLD FOR MARINE BIOLOGISTS. Natural History. April, 1961: 8-16.

Perkins, Karen. No date. SOUTHERN CALIFORNIA MARINE PLANKTERS. Orange Co. Dept. of Ed., Publication Sales. 1300-B South Grand Ave., P. O. Box 11846, Santa Ana, CA 92711. 4 p. Species most frequently encountered from Seal Beach to Dana Point. At Orange County.

Pletcher, T. F. 1968. INQUIRY INTO LIFE PROCESSES USING LIVE LAMPREYS IN THE LABORATORY OR CLASSROOM. American Biology Teacher, 30 (9): 734-8.
Useful in marine science instruction as well as other sciences. SB.

Project COAST.* No date. #113 ANIMAL BEHAVIOR--MUD SNAIL RESPONSES. 3 p.
This learning experience introduces the scientific method through a simple experimental procedure involving mud snails. The experiment attempts to determine what environmental conditions will cause a retracted snail to emerge from its shell. Has language arts supplement. Gr. 4-7.

Project COAST.* No date. #216 BAY-DUNE TRANSECT AT CAPE HENLOPEN STATE PARK. 6 p.
The purpose of this study is to investigate the succession of plant life from the bay to an inland area. Background information describing the floral zones along the transect and instructions for making a bay-dune transect are included. Gr. 5-8.

Project COAST.* No date. #231 BITING FLIES OF THE COASTAL REGION. 21 p.
This unit uses the inquiry approach to describe the life cycles, morphology, and methods of control for the five major types of biting flies of the middle Atlantic coastal region. Five transparency/handout masters, instructions on building and using a box trap, and an exercise in graph interpretation are included. Gr. 7-10.

Project COAST.* No date. #201 THE BLUE CRAB. 18 p.
A detailed introduction on the blue crab's life cycle, a list of thirty-two points to be covered, and an instructional outline provide background for the teacher. The lesson includes a pre- and post-test, discussion topics, plans for a field trip, three transparency/handout masters, and a glossary of terms. Has a language arts supplement. Gr. 5-8.

Project COAST.* No date. #309 COLLECTING AND CULTIVATING MARINE BACTERIA. 10 p.
Types of bacteria, their importance in the marine environment, and various sampling and culturing techniques are described in the introductory reading. An outline of materials, equipment, and laboratory procedures for collecting, cultivating, and determining bacterial types is provided, along with a data sheet and diagram of the formation of marine sediments and the bacterial activity upon the various substrates. Gr. 10-12.

Project COAST.* No date. #227 A COMPARATIVE STUDY OF CLAM AND SQUID. 20 p.
The comparative anatomy of two mollusks may be undertaken by investigating the clam and the squid. Teacher preparation, classroom procedure, lecture notes, and dissection procedures are outlined for each organism. Pre- and post-tests, a mollusk crossword puzzle, and bibliography are also provided. Gr. 7-10.

Project COAST.* No date. #232 DIATOMS: NATURE'S AQUATIC GEMS. 23 p.
With the aid of eight slides and six diagrams, this independent study learning experience describes the biological characteristics and habits of diatoms. Included are questions, an anagram, instructions for collecting various types of diatoms, and a diatom classification key. Gr. 7-10.

Project COAST.* No date. #202 DISTRIBUTION OF SALT MARSH LIFE. 13 p.
This unit uses two experiments to examine how elevation and salinity affect the distribution of marsh plants and animals. By performing these experiments on a field trip, the student will be able to identify the animal life and vegetation of a salt marsh and understand the ecology of the marsh habitat. Teacher background and a bibliography for additional information are given as well as lesson preparation suggestions and instructional procedures for the various activities. Data worksheets are available for the student, along with transparency/handout masters on the plants of the tide marsh, life of the salt marsh, and the salt marsh food web. Has a language arts supplement. Gr. 5-10.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Project COAST.* No date. #234 ECOLOGY OF SAND DUNES. 6 p.
The article "The Ecology of Sand Dunes," by William H. Amos, The Science Teacher, February 1968, describing sand dunes characteristics and their biology, serves as the basis for this lesson plan. Suggestions for field investigations and additional studies are included. Gr. 7-12.

Project COAST.* No date. #229 EFFECTS OF DDT ON OSPREY REPRODUCTION. 23 p.
This learning experience is presented in the form of an inquiry, constructed so that students may seek and evaluate evidence through step-by-step investigations. This process is accomplished via suggested teacher "inputs," introducing the DDT problem and guiding student discussion as to the pesticide's effect on osprey reproduction. Seven transparency/handout masters, a suggested reading list, and "DDT on Balance," a magazine article reprinted from Pesticides, A Scientists' Institute for Public Information Workbook, are also included. Gr. 7-10.

Project COAST.* No date. #245 FOOD WEBS IN THE MARINE HABITAT. 45 p.
The text, which can be used either as student reading or as a teacher presentation, expands on the students' knowledge of the ecosystem concept and describes oceanic organisms found in various trophic levels. Students are asked to answer questions throughout the text and construct a marine food web as a final exercise. A readiness test, post-test, glossary, bibliography, and transparency/handout masters of representative organisms from all trophic levels are included. Gr. 7-12.

Project COAST.* No date. #228 FOSSIL COLLECTING ALONG THE CHESAPEAKE AND DELAWARE CANAL. 6 p. 29 slides.
Designed for the teacher with little experience in fossil studies, this learning experience consists of a pre-test, a slide presentation with many examples of fossils, and a post-test. A field trip is strongly recommended, with the narration from the slide presentation serving as a guide for such an expedition. Gr. 7-10.

Project COAST.* No date. #3 MARINE AQUARIA. 6 p.
An article from the American Biology Teacher describes a simple and inexpensive procedure for collecting and transporting marine organisms and establishing salt water aquaria. Supplementary notes include information on the maintenance of the tanks and the types of marine organisms found in the Delaware region that would be suitable for these marine aquaria. Has a language arts supplement. Gr. K-12.

Project COAST.* No date. #4 MARINE ORGANISM SLIDE COLLECTION. 4 p., 95 slides.
Ninety-five slides illustrate a wide range of marine vertebrates, invertebrates, and plants found in the Middle Atlantic coastal region. Descriptions of the slides are included. Gr. K-12.

Project COAST.* No date. #230 MARSHES: NATURE'S BOUNTY. 17 p., 29 slides.
A narration describing the flora, fauna, and uses of a marsh accompanies twenty-nine slides. Three transparency masters dealing with food chains, the salt marsh food web, and life of the salt marsh are included. Gr. 7-12.

Project COAST.* No date. #219 MICROFOSSILS FROM THE LOCAL MARINE ENVIRONMENT. 29 p.
The morphology and life history of common microfossils of the Delaware Bay region, such as foraminifera, are presented. The unit includes pre- and post-tests, information on sampling techniques, an outline of laboratory materials and procedures, a glossary, and a pictorial key to fossil identification, all for use by the student. Gr. 7-9.

Project COAST.* No date. #204 THE NOISY DEEP. 8 p.
"The Noisy Deep," an article dealing with mysterious sounds under the sea, is the basis of this lesson plan. Activities include simple sound transmission experiments, reading, and vocabulary and comprehension exercises. Has a language arts supplement. Gr. 5-10.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Project COAST.* No date. #224 OBSERVING STARFISH--THE WATER VASCULAR SYSTEM. 24 p.
This lab study on the starfish's structure and locomotion and feeding systems contains extensive teacher background, with information on the morphology of the starfish, collection and maintenance methods, and instructional procedures. Pre- and post-tests, discussion topics, a "new terms" list, a bibliography, and six transparency masters are also included. Gr. 7-10.

Project COAST.* No date. #305 THE OCEAN: SOURCE OF NUTRITION FOR THE FUTURE. 18 p.
This lesson plan deals with three major future food sources from the sea: (1) marine plants, (2) aquaculture, and (3) fish protein concentrate. The nutritional significance and the advantages and disadvantages of each source are discussed. Each section outlines the lesson objectives, needed materials, and instructional procedures. Homework assignments, a pre-test, and a series of recipes using fish protein concentrate are also included. Gr. 9-12.

Project COAST.* No date. #304 PRIMARY ECOLOGICAL SUCCESSION AT THE C & D CANAL SPOILS. 13 p., 23 slides.
Twenty-three slides with accompanying descriptions provide the basis for this study of floral and faunal succession and ecological interaction. The unit, which may be used as a guide for a field trip, also contains a readiness test and a pre- and post-test.

Project COAST.* No date. #314 REPORT ON AN EXPERIMENTAL STUDY OF THE EFFECTS OF PESTICIDES ON KILLIFISH. 9 p.
By determining the level of acetylcholinesterase in the brains of killifish, the effect of an organophosphate pesticide may be studied. The methods and materials for performing such an experiment are described in detail. The data, results, and discussion of an actual experiment are also given. Gr. 12.

Project COAST.* No date. #225 THE ROCKY SHORE. 29 p., 7 slides.
A student background section describes the rocky shore, its zonations, and the types of organisms found in each zone. Supplementary material includes five transparency/handout masters, seven slides, a field trip outline and worksheet, pre- and post-tests, and a list of additional activities. Gr. 7-10.

Project COAST.* No date. #218 THE SUBSETS OF THE COASTAL ZONE. 10 p.
The mathematics of sets, including operations, intersections, unions, and complements, are explained through the use of Venn diagrams and examples. Exercises are provided which apply set theory to the grouping of animals commonly found in the Delaware coastal zone. Gr. 7-9.

Project COAST.* No date. #205 TESTING WATER FOR BACTERIAL POLLUTION. 22 p.
Background information on microorganisms found in lakes, rivers, and other bodies of water is given. Two methods of examining these bacteria in sewage and tap water are described: one requires the Millipore Corporation's Environmental Microbiology Kit; the other does not. Questions are offered as an exercise for students. An appendix includes information from the Millipore Corporation and eight pages of tables, graphs, and charts of previous bacterial studies. Has a language arts supplement. Gr. 8-12.

Project COAST.* No date. #210 UTILIZATION OF ESTUARINE ORGANISMS BY THE INDIANS. 46 p., 48 slides.
The estuarine environment provided primitive people with many types of plants and animals upon which they could base their survival. This unit describes the estuarine habitat and the types of flora and fauna found in it. It also deals in depth with the manner in which the North American Indian acquired and used these organisms for food, building materials, utensils, ornaments, and trade items. The extensive slide collection illustrates every aspect of the lesson plan. Pre- and post-tests and a crossword puzzle are provided, along with many activities simulating primitive man's use of his environment. Gr. 6-8.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711

Project COAST.* No date. #209 WHERE HAVE ALL THE MENHADEN GONE? 20 p.
Three readings are presented: the first one describes the morphology, life cycle, and commercial uses of the menhaden; the second includes landing statistics and an explanation of how menhaden are caught; and the third reading suggests possible reasons for the decline of the menhaden population along the middle Atlantic coast. Supplemental material includes a worksheet with each reading, pre- and post-tests, and four transparency/handout masters. The instructional procedures section outlines a schedule for teaching the unit. Has a language arts supplement. Gr. 6-8.

Project COAST.* No date. #220 YEAR OF THE WHALE. 7 p.
A number of activities based on the book The Year of the Whale by Victor B. Scheffer are suggested. These activities include reading comprehension, map interpretation, small group discussion, and research papers. Gr. 7-9.

Project COAST.* No date. #303 ZONATION OF A ROCKY COAST. 8 p.
Zonation is studied from an ecological viewpoint, with emphasis on field research activities. The student will learn not only in which zone a particular organism is found, but also why. Field study procedures are described in the text and possible results are illustrated in three drawings. Gr. 9-12.

Raimist, Roger J. 1967. LABORATORY EXPERIENCES IN MARINE BIOLOGY FOR UPPER ELEMENTARY AND SECONDARY SCHOOL GRADES -- STUDENT EDITION. Conservation and Environmental Science Center for Southern New Jersey, Inc. Browns Mills, NJ 08015. ERIC ED 039 145. 17 p.
Student edition of five laboratory experiences with references and supplemental reading for each topic. Gr. 7-12. MB.

Raimist, Roger J. 1967. LABORATORY EXPERIENCES IN MARINE BIOLOGY FOR UPPER ELEMENTARY AND SECONDARY SCHOOL GRADES -- TEACHER'S EDITION. Conservation and Environmental Science Center for Southern New Jersey, Inc. Browns Mills, NJ 08015. ERIC ED 039 123. 29 p.
Teacher's guide to five laboratory experiences (oxygen consumption measurement, population density, sea urchin fertilization, salinity tolerance, food webs of shore organisms). After each exercise are suggestions for further research; a list of related references for teachers and a general bibliography are also included. Also includes general information on maintaining marine aquaria and collecting marine organisms. (Title III). Gr. 7-12. MB.

Reese, Ernst S. BEHAVIOR AND ECOLOGY OF CORAL REEF FISHES - A FILM STUDY GUIDE. Science Software Systems, Inc., 11899 West Pico Blvd., West Los Angeles, CA. 90084

Reese, Ernst S. THE SOCIAL BIOLOGY OF BUTTERFLYFISH - A FILM STUDY GUIDE. (address above)

Regional Marine Science Project. 1971. THE MAJOR COASTAL COMMUNITIES OF NORTH CAROLINA. Regional Marine Science Project, Carteret County Public Schools. Beaufort, NC 28516. ERIC ED 020 829. 29 p.
Describes environmental factors, plants and animals of ocean beach, dune, sound, salt marsh, tidal flat and jetty habitats. Illustrative drawings of plants and animals are accompanied by explanations and generic names. Descriptions and illustrations are presented in terms of gradients which affect life--salinity, temperature, light, texture, content of the substrate and physical disturbance. (Title III). Gr. 7-12. MB.

Rice, Marc R. 1976. MARINE BIOLOGY LABORATORY GUIDE. Hawaii Preparatory Academy. Kamuela, HI 96743. 21 p.
The guide was used for a three-week Marine Biology course offered through the American Institute of Foreign Study. It was specifically designed for use in Hawaii, and modeled to fit the facilities and environment available at the Hawaii Preparatory Academy. At Rice.

Rose, Dale E. No date. SOME COMMON MARINE ANIMALS AND PLANTS OF TIDEWATER VIRGINIA. Hampton City Schools. Hampton, VA. 40 p.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Salber, Lee D. 1972. ESTUARY, WHAT A CRAZY PLACE. National Wildlife Federation, Washington, D.C. 18 p.
Pamphlet summarizing the wildlife, ecology, and problems of estuaries.

San Julian, Gary J. ECOLOGY AND ENVIRONMENT ISSUES. No date. 239 Forestry Colorado State Univ., Ft. Collins, Colorado, 80521.
A college level correspondence course in general Ecology.

Scarff, Judith. 1969-71. MARINE ECOLOGY. Regional Marine Science Project, Carteret County Public Schools. Beaufort, NC 28516.
Marine ecology is a full-year elective course in advanced biology with emphasis on methods of scientific investigation (in four volumes, three now available).

Volume 2, ECOSYSTEMS, 1969, 128 p. Detailed outline and lectures for a course in ecology and marine ecosystems. Lab exercises, a field trip to a salt marsh, films and an extensive bibliography for students and teachers are included.

Volume 3, OCEAN BIOLOGY, 1970, 185 p. Detailed outline and lectures for a course in open ocean biology. Field trips concerning classifying estuaries, life of the estuary, study of oceanic plankton, a tour of the Eastward films and an extensive bibliography are included.

Addendum to Volume 3, THE MAJOR MARINE PLANT AND INVERTEBRATE ANIMAL PHYLA, 1971, 81 p. An overview of the marine plant phyla (from fungi, bacteria, and algae to the higher marine plants) and the marine invertebrate phyla (from Protozoa through Chordata). Examples of each class, illustrations and an extensive bibliography are included. (Title III). Gr. 11-12. MB.

Schnitger, Ronald L. 1970. LABORATORY EXERCISES--MARINE SCIENCE FLOATING LABORATORY. Marine Science Floating Laboratory Program. Orange County Board of Education. 1104 Civic Center Drive West, Santa Ana, CA 92701. 71 p.
Thirteen laboratory exercises to be used in the high school biology lab program (age determination of a fish, dissection of a starfish, etc.), either in preparation for or follow-up of marine science field work, are discussed and outlined in detail. (Title III). Gr. 9-12. MB.

----. 1977. SEA PLANTS. New York Aquarium Education Dept. Boardwalk & W. 8th St., Brooklyn, N. Y. 11224.

Sherman, Kenneth. 1962. ZOOPLANKTON, A RICH FAUNA FOR HIGH SCHOOL RESEARCH. American Biology Teacher, 24 (7): 487-495.
An outline of a project to determine the seasonal abundance of various zooplankton constituents The author includes descriptions of the field methods which were used. SB.

Shettler, James. 1971. HANDBOOK OF TECHNIQUES AND GUIDES FOR THE STUDY OF THE SAN FRANCISCO BAY-DELTA-ESTUARY COMPLEX, PART 3. KEY TO THE INVERTEBRATES. Alameda County School Dept., Hayward, CA., Contra Costa County Dept. of Education, Pleasant Hill, CA. 41 p.

Silberhorn, Gene M. TIDAL WETLAND PLANTS OF VIRGINIA. 1976. Educational Series, No. 19. Virginia Institute of Marine Science, Gloucester Point, VA. 86 pages.
Coastal flora of Virginia coast identified.

Silverstein, Harold and Lou Siegel. No date. LABORATORY AND FIELD MANUAL: MARINE BIOLOGY. John Dewey High School, New York State Marine Education Association. 381 Park Ave. South, New York, NY 10016.

Skidaway Institute of Oceanography. No date. COASTAL RIVER COMMUNITIES. Skidaway Institute of Oceanography. Savannah, GA.

South Shore High School. No date. CURRICULUM OUTLINE -- MARINE BIOLOGY. South Shore High School. Brooklyn, NY.

Texas A. & M. Univ. No date. SEA GRANT 70's. College Station, TX. 77843.
Supplemental reading material on various aspects of marine biology and education.

Valentine, David. 1969. FAMILY KEY TO THE FISH COMMONLY TAKEN ON BOARD THE ORANGE COUNTY MARINE SCIENCE FLOATING LABORATORY. Department of Environmental Biology, University of California --San Diego. San Diego, CA 92110. ERIC ED 051 988. 31 p.
A key to the families of marine fish commonly taken aboard the Orange County Marine Science Floating Laboratory. This key has been designed for use by junior and senior high school students. Diagrams and drawings are provided which indicate distinguishing characteristics of various members of the fish families. (Title III). Gr. 7-12. MB.

Virginia Institute of Marine Science. 1977. MARINE EDUCATION MATERIALS SYSTEM. Gloucester Point, VA. 23062.
See entry under Gammisch, Susan

Voss, Gilbert E., et. al. No date. FIELD GUIDE SERIES 1,2,3,4,5,6. P.O Box 248106, Coral Gables, Fl. 33124. All grades.
These well illustrated handbooks enable observers to identify various plants and animals in these regions without recourse to a microscope.

Warland, J. Robt. 1977. COMMON SEAWEEDS OF THE PACIFIC COAST. J.J. Douglas Ltd. 1875 Welch Street, North Vancouver, British Columbia. 112 pages.

Warner, Carolyn. No date. THE WHALING MUSEUM. Box 25, Cold Springs Harbor, N.Y. 11724.
Various publications available through the museum.

Weiss, Howard M., editor. 1978. A FIELD GUIDE TO THE PLANTS AND ANIMALS OF LONG ISLAND SOUND. Oceanic Society, Stamford, Connecticut.
A guide to plants and animals in Long Island Sound. Hundreds of large, easy to identify illustrations. Jr. and Sr. High School.

Werner, Milton C. 1977. THE DEVELOPMENT OF MARINE SCIENCE MINI-UNITS FOR THE SECONDARY LEVEL USING BAY FARM AND ALAMEDA ISLAND ECOSYSTEMS. Master's Thesis, California State University at Hayward.
The thesis is basically a one semester course in Marine Science for grades 9 through 12. Students that complete the course will be able to test the chemical and physical factors of sea water; collect and identify macro-algae, coastal plants, mammals, plankton, fish and birds; recognize the four major zones of the intertidal region using the transect method; conduct population studies using the quadrat method; construct sampling equipment. Gr. 9-12.
A: M. Werner.

---------. No date. THE WHALE BOOK. Endangered Species Production. P. O. Box 472, Prudential Center Station, Boston, MA 02116.
Contains information about whales, whaling practices past and present. Lists AV sources, charts and considerable information about whale conservation with tips on whom to write so to bring about change in whaling practices.

Wheaton, Frederick W. No date. AQUACULTURAL ENGINEERING. U. of Maryland Aquacultural Engineering Dept. College Park, MD. 20742.
Focuses on the technical problems associated with the production of food and fiber from aquatic resources.

Williams, H. R. 1971. KEYS TO THE COMMON GENERA OF MARINE PLANTS TAKEN ABOARD THE ORANGE COUNTY MARINE SCIENCE FLOATING LABORATORY. Golden West College. Huntington Beach, CA 94547. ERIC ED 051 989. 13 p.
A key to the common genera of marine algae and angiosperms which are taken aboard the Orange County Marine Science Floating Laboratory. Drawings of representative members of the various genera are included. (Title III). Gr. 7-12. MB.

Williams, Hayden. No date. NATURAL HISTORY GUIDE TO THE VICINITY OF THE MARINE STUDIES INSTITUTE AT DANA POINT. Orange County Department of Education, Publication Sales. 1300-B South Grand Ave., P. O. Box 11846, Santa Ana, CA 92711. 9 p.
Includes the geology, birds and marine biology of the Dana Point area. A: Orange County.

Wiper, Harold,ed. 1972.ACTIVITIES FOR MARINE BIOLOGY. NEMRIP, Narragansett Bay Campus. University of Rhode Island, Narragansett, RI 02882.
Approximately 20 marine biology laboratory activities (in both classroom and field) compiled and in use by secondary school biology teachers attending the Suffolk University Marine Biology Symposium, March, 1972. Gr. 7-12. MB.

Wiper, Harold. No date. MARINE BIOLOGY: COURSE OUTLINE. Massachusetts Marine Educators, Newton North High School. Newtonville, MA 02160.

Wollam, Michael. No date. MULLET KEY FIELD GUIDE, MARINE SCIENCE STATION. Mt. Dora High School. Mt. Dora, FL.

SECONDARY LEVEL

PHYSICAL AND CHEMICAL OCEANOGRAPHY

Alameda County School Department. 1971. HANDBOOK OF TECHNIQUES AND GUIDES FOR THE STUDY OF THE SAN FRANCISCO BAY-DELTA-ESTUARY COMPLEX, PART 1, MONITORING TECHNIQUES FOR THE MEASUREMENT OF PHYSICO-CHEMICAL AND BIOLOGICAL PARAMETERS. Alameda County School Department. Hayward, CA., Contra Costa County Department of Education, Pleasant Hill, CA. 120 p.

Barton, Jackie. 1977. PHYSICAL OCEANOGRAPHY, A MINICOURSE. J. Barton. 6017 Cherryhill, Houston, TX 77087.
Available by writing J. Barton. Prepared along individualized self-paced lines and developed in accordance with methods and objectives set forth in the TEXAS SCIENCE FRAMEWORK (draft), Texas Ed. Agency, Austin, TX., Sept. 1975. Gr. 10-12. A: Jackie Barton.

Bergen, Robert A. No date. DIRTY WATER, CLEAN WATER. Pine Jog Environmental Sciences Center, Florida Atlantic University. 6301 Summit Blvd., West Palm Beach, FL 33406.

Chapman, Frank L. 1968. THE SEA--A RESTLESS GIANT. Regional Marine Science Project, Carteret County Public Schools. Beaufort, NC 28516. ERIC ED 020 053. 44 p.
This eighth-grade unit includes narrative and diagrammatic descriptions of various ocean phenomena such as tides, waves, currents, ocean floor and beaches. Class questions and discussion questions are provided at the end of each section of the unit. A vocabulary list is found at the end of each narrative discussion. (Title III). Gr. 8. MB.

Cox, Louis T. 1964. ENERGY AND WAVES (with separate teachers' guide). Teachers' Publishing Corporation. Darien, CT.

Dewees, Christopher M. and Jon K. Hooper. 1976. OCEAN CURRENTS. Sea Grant Marine Advisory Publ. 2554. Univ. of Cal., Div of Ag. Serv., Berkeley, CA. 94720. 2 p.
Instructions for simple demonstrations of salinity and temperature effects on currents.

Dewees, Christopher M. and Jon K. Hooper. 1976. PHYSICAL OCEANOGRAPHY. Sea Grant Marine Advisory Publ. 2233. Univ. of Cal., Div. of Ag. Serv., Berkeley, CA. 94720. 9 p.
Introduction to vocabulary and basic concepts associated with the ocean floor, tides, waves, the nature of seawater, and upswelling.

DuClose, Don. No date. A STUDY OF SEAWATER. George Mann Marine Science Center. 1347 Palmer Street, Mayport, FL 32233.

Giles, Donald E. No date. OCEAN CURRENTS. Oregon State Marine Science Center. Corvallis, OR. 97330

Hahn, George W. No date. OXYGEN IN SEAWATER. M.A.R.E. Box 44, Newtonville, MA 02160.

Marine Science Education Center. No date. CHEMISTRY OF THE OCEAN AND RIVER, GRADE EIGHT. Marine Science Education Center. 1347 Palmer St., Mayport, FL 32267. 19 p.
This unit develops an awareness of chemical oceanography subject matter, methods and materials, and chemically-related ecological problems. This two-week unit also includes discussion questions and many classroom-field activities. Gr. 8. MB.

Nye, Marylinn E. No date. PHYSICAL SCIENCE, OCEANOGRAPHY. John Hersey High School. 1900 E. Thomas, Arlington Heights, IL 60004.
A one-semester course taught to tenth graders at John Hersey High School, Arlington Heights. Gr. 10.

Project COAST.* No date. #223 AIR AND LIFE. 18 p.
With the use of simple experiments, concepts such as the origins of atmospheric gases, utilization of these gases by terrestrial and aquatic organisms, and the relationship between atmospheric and oceanic circulations are studied. Five transparency/handout masters illustrate gaseous cycles in the atmosphere and oceans. Gr. 7-10.

Project COAST.* No date. #222 DISSOLVED OXYGEN MEASURED QUALITATIVELY. 25 p.
The methylene blue procedure for detection of dissolved oxygen is explained for student use. Four written activities emphasizing the importance of dissolved oxygen to water quality and marine life are also provided. Each activity contains data for the student to interpret and graph. The teacher is supplied with background information, pre- and post-tests, questions, and suggested answers. Gr. 7-10.

Project COAST.* No date. #241 DO FARMS POLLUTE? 10 p.
This learning experience discusses organic, chemical, and sedimentary pollution of water from farms. Teacher background, classroom discussion questions with suggested answers, and references are provided. Also included are solid waste production figures and a newspaper reprint about an effort to recycle cow manure. Gr. 5-8.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Project COAST.* No date. #307 MEASURI... DISSOLVED OXYGEN QUANTITATIVELY. 19 p.
The objectives of this lesson are: (1) to teach quantitative methods for measuring dissolved oxygen and (2) to show the relationships between dissolved oxygen levels and the types of organisms present in a stream. Laboratory activities, graphing exercises, a pre- and post-test, and references are also included. Gr. 10-12.

Project COAST.* No date. #312 MERCURY--ITS CHEMISTRY IN THE ECOSYSTEM. 25 p.
This learning experience can be used as a self-taught and/or teacher-taught study. The teacher presentation is based on the monograph Mercury--Its Chemistry in the Ecosystem, prepared by the American Chemical Society, and is supplemented by a lesson introduction, six transparency masters, a list of discussion topics, and a post-test. Individual reading, a glossary of terms, and two worksheets dealing with forms of mercury in the ecosystem and their origin are also provided. Gr. 10-12.

Project COAST.* No date. #214 THE MOON, THE SUN, AND TIDES. 23 p.
The teacher background contains information about the causes of tides, three transparency masters, pre- and post-tests, and a schedule for presenting the lesson. Three activities enable the student to predict tides and to observe how they are caused. Has a language arts supplement. Gr. 6-12.

Project COAST.* No date. #301 THE OIL SPILL PROBLEM. 42 p.
This unit covers a wide range of oil pollution subjects, including the need for supertankers, their effects on the oil industry, the types of oil spill removal processes, and the effects of oil pollution on the physical and biological environments. In the unit, students will engage in a variety of mathematics, economics, and science activities. Gr. 9-10.

Project COAST.* No date. #237 PESTICIDES AND THE MARINE ENVIRONMENT. 13 p.
An extensive teacher background describes, with the use of graphs, the effects pesticides may have on the photosynthetic activities of aquatic algae. A teacher-guided inquiry follows. Gr. 7-12.

Project COAST.* No date. #306 PHYSICAL PROPERTIES OF WATER. 16 p.
This learning experience is a teaching outline covering the physical and chemical properties of water, including molecular structure, solution chemistry, abnormal water behavior, and purification techniques. Biological and conservational aspects of water are also covered. Pre- and post-tests, student activities, and six transparency masters supplement the lesson outline. Gr. 10-12.

Project COAST.* No date. #313 QUANTITATIVE AND QUALITATIVE ANALYSIS OF PHOSPHATE IN WATER. 12 p.
Objectives, concepts, equipment, reagents, and procedures for the laboratory determination of dissolved phosphate are outlined in detail. Also included is background information on the presence of phosphate in the marine environment. Gr. 11-12.

Project COAST.* No date. #308 SALINITY CHANGES IN A TIDAL RIVER. 37 p.
The purpose of this unit is to organize and conduct a marine field study and to interpret the results. Background on tidal flow theory, salinity, proper field procedure, and data correlations, is provided, as well as a list of lab, field, and classroom activities, Data sheets, transparency/handout masters, discussion topic suggestions, and a post-test are also included. Gr. 10-12.

Project COAST.* No date. #320 THERMAL POLLUTION BY NUCLEAR POWER PLANTS. 28 p.
The problem of thermal pollution is introduced in background material. The classroom procedure consists of a series of questions and answers dealing with nuclear power plant structures, water cooling processes, and how thermal pollution affects the stratification, oxygen concentrates, and ecosystem of the marine environment. Two tables and seventeen transparency/handout masters illustrate many of the points covered in the inquiry. Gr. 10-12.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Project COAST.* No date. #221 WATER DENSITY AND OCEAN CURRENTS. 9 p.
This learning experience explores how water density affects ocean currents. Four simple experiments illustrate the different properties of water density and density-caused currents. Gr. 7-10.

Project COAST.* No date. #236 WATER QUALITY AND TREATMENT. 13 p.
The fact that our drinking water can be polluted and may require purification is emphasized. Background information on the Brandywine watershed and Wilmington's water purification process and a small detailed map of New Castle County are provided. Introductory questions, a vocabulary exercise, and a materials list of student activities on Wilmington's intake water system and water content testing are also included. Hach, LaMotte, and Millipore analysis equipment is used. Gr. 7-9.

Project COAST.* No date. #217 WHAT IS PHYSICAL OCEANOGRAPHY? 11 p.
Physical oceanography encompasses many areas of science, including chemistry, geology, and biology. This learning experience combines these disciplines by covering such topics as properties of water, tides, waves, currents, and features of the ocean floor. Student projects are suggested. Gr. 7-9.

Schlenker, R. M. 1977. INVESTIGATIONS IN MARINE CHEMISTRY: SALINITY I. U. S. Office of Education. ERIC ED 128 206.
This is a discovery unit in which students investigate salinity by measuring the electrical conductivity of water of varying salinities. The unit is best suited for high school level students, but could be used at the Junior High level. A: R. M. Schlenker, Univ. of Maine, Orono, ME.

Schlenker, R. M. 1977. INVESTIGATIONS IN MARINE CHEMISTRY: SALINITY II. U. S. Office of Education. ERIC ED 128 207.
This is an extension of the Salinity I unit: a discovery unit in which students investigate salinity by measuring the electrical conductivity of water of varying salinities. The unit is best suited for high school, but could be used at the junior high level. A: R. M. Schenker, Univ. of Maine, Orono, ME.

Schlenker, R. M. 1977. INVESTIGATIONS IN MARINE CHEMISTRY: TIDE POOL ECOLOGY. U. S. Office of Education. ERIC ED 128 205.
In this unit, students investigate varying tide pool salinities at varying levels in the intertidal zone. A: R. M. Schlenker, Univ. of Maine, Orono, ME.

Sohn, Bernard I. No date. EXERCISES ABOUT POLLUTION: WATER POLLUTION INVESTIGATIONS FOR THE SECONDARY AND COLLEGIATE STUDENT. Millipore Corporation. Bedford, MA.

Turekian, Karl K. 1976. OCEANS. Senior High and up. Prentice-Hall, Inc., Englewood Cliffs, N.J. 149 pages.
Detailed, scientific text that explores the chemistry and geology of oceans, as well as the circulation of the oceans and the role of the biological activity in the seas. Illustrations, photos, graphs and charts accompany text.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

SECONDARY LEVEL

GEOLOGICAL OCEANOGRAPHY

Awkerman, Gary L. 1973. SEA CHANGES, TOPICS IN MARINE EARTH SCIENCES. U. S. Office of Education. ERIC ED 086 556.
Designed to be used as a standard science curriculum. Covers continental drift, shoreline changes, sea level changes, beaches, nearshore currents and man-made structures and estuaries. SB.

Bergen, Robert A. No date. BEACH DYNAMICS. Pine Jog Environmental Sciences Center, Florida Atlantic University. 6301 Summit Blvd., West Palm Beach, FL 33406.

Bergen, Robert A. No date. THE DYNAMICS OF BEACHES: FIELD INVESTIGATIONS. Pine Jog Environmental Sciences Center, Florida Atlantic University. 6301 Summit Blvd., West Palm Beach, FL 33406.

Godfrey, Paul J. and Will Hon. 1970. DUNE DETECTIVE, USING ECOLOGICAL STUDIES TO RECONSTRUCT EVENTS WHICH SHAPED A BARRIER ISLAND. Carteret County Public Schools. Beaufort, NC. U. S. Office of Education. ERIC ED 061 060. 34 p.
Students in grades eleven and twelve are exposed to research methods through a variety of field experiences.

King, Cuchlaine A. M. and Marie Morisawa. No date. MONITORING THE SEASHORE. New York Sea Grant Advisory Service. Fernow Hall, Ithaca, NY 14850.

Kroeck, Dick. No date. EVERYONE'S SPACE HANDBOOK. P.O. Box 22, 934 H. Street, Arcata, California. 95521. Source manual of photo imagery.

Lee County Environmental Education Program. No date. BEACHES IN MOTION. Lee County Environmental Education Program, Environmental Education. 2260 Second St., Fort Myers, FL 33901.

Lewis, Robert E. No date. THE GEOLOGY OF THE DELAWARE COASTAL ENVIRONMENTS: TEACHER'S MANUAL. DelMod System. P. O. Box 192, Dover, DE 19901.

Manglesdorf, Fred E. 1974. MAN'S IMPACT ON THE ENVIRONMENT: THE BARRIER BEACH AS AN ECOSYSTEM. Brevard County School Board, Cocoa, FL. U. S. Office of Education. ERIC ED 106 076.
Deals with biotic factors of the barrier beach ecosystem as well as natural factors. Includes a section on activities. SB.

McAllister, Raymond F. No date. HOW TO USE MARKS OR RANGES. McAllister Marine, 482 S.W. 9th St., Boca Raton, Fl. 33432. 1 p.

Nassau County Museum of Natural History. No date. EDUCATION LEAFLETS: THE SAND DUNE, THE SHORE, THE OCEAN, THE WETLANDS, THE GEOLOGICAL HISTORY OF LONG ISLAND. Nassau County Museum of Natural History. Seaford, NY.

Oregon State University Marine Advisory Program. No date. SO YOU'RE GOING TO THE BEACH. Oregon State University Marine Advisory Program. Corvallis, OR.

Ponti, R. A. 1965. A UNIT ON SAND DUNES AS AN INTRODUCTION TO EARTH SCIENCE IN JUNIOR HIGH. Master's Thesis, Rhode Island College, Providence, RI. SB.

Project COAST.* No date. #240 BEACHES: A GEOLOGICAL STUDY. 24 p.
An "In the Classroom" section describes, with the aid of four transparency/handout masters, a typical sandy beach profile. The second part of the unit outlines field procedures and materials needed to collect water and core samples, make beach profiles, and measure tide and wave levels. The laboratory follow-up section includes procedures for analyzing the water and core samples. Gr. 8-12.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Project COAST.* No date. #207 CAPE HENLOPEN LIGHTHOUSE--HOW? WHEN? WHERE? 43 p.
This learning experience outlines four activities to use in investigating the following questions: Where is Cape Henlopen? What is Cape Henlopen? How has Cape Henlopen changed since it was first discovered by the Europeans? What happened to the "Old Man of the Atlantic," the Cape Henlopen Lighthouse? Each activity contains a list of objectives, materials, teaching procedures, and additional material such as teacher background, vocabulary lists, readings, and maps illustrating the changing coastline. Has a language arts supplement. Gr. 6-8.

Project COAST.* No date. #310 TO RECOGNIZE, RECORD, AND ANALYZE CHARACTERISTICS OF A SANDY BEACH ENVIRONMENT. 26 p., 22 slides.
A description of dune types and formations and a slide presentation with comments are provided as an in-class activity. The slide show may be used as a preview to or in place of a field trip. Field procedures for measuring the beach profile and sand moisture content, and studying and analyzing vegetation are outlined in detail. Pre- and post-tests are also provided. Gr. 10-12.

Project COAST.* No date. #302 SEA FLOOR SPREADING. 49 p.
This independent study lesson plan is designed so that the student can arrive at the theory of plate tectonics in much the same manner as it was actually done by scientists. During the unit, the student will learn oceanographic terminology, locate numerous topographic features associated with ocean basins, and understand how seemingly unrelated data are tied together to develop a theory. The teacher section provides objectives, notes on procedures, and the answers to the questions asked in the student section. Gr. 9-12.

Rivers, W. Guy. 1976. BARRIER ISLANDS AND BEACHES; TECHNICAL PROCEEDINGS OF THE 1976 BARRIER ISLANDS WORKSHOP, ANNAPOLIS, MARYLAND. MAY 17-18, 1976. Dept of Conservation Foundation, 1717 Massachusetts Ave., NW, Washington, D.C. 20036. High school-college.

Shafer, Thayer C. SEAPORT CITY, A LAND USE SIMULATION; 546-B Presidio Blvd., San Francisco, CA.

Shelter Island High School. No date. MARINE SCIENCE MINI COURSES. Shelter Island High School. Shelter Island, NY.

Sikora, Bob. 1973. HANDBOOK OF TECHNIQUES AND GUIDE FOR THE STUDY OF THE SAN FRANCISCO BAY-DELTA-ESTUARY COMPLEX: A KEY TO THE COMMON FISHES OF SAN FRANCISCO BAY, PART IV. Grades 7-12. Director, Project MER, Contra Costa County Superintendent of Schools, 75 Santa Barbara Rd., Pleasant Hill, CA. 94523. 12 pages.

Town of Oyster Bay Department of Parks and Recreation. No date. THE BARRIER BEACH AND ESTUARY, SHORT COURSE FOR TEACHERS. Department of Parks and Recreation. Oyster Bay, NY.

Wiper, Sandy. No date. BEACH GRASS: HALT EROSION. Newton North High School. Newtonville, MA 02160.

Wright, Valerie, and John J. Smith. 1976. NATURAL BRIDGES TIDE POOLS. Coastal Marine Laboratory, Univ. of CA., Santa Cruz, CA., 95064. Pamphlet.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

SECONDARY LEVEL

LABORATORY AND FIELD ORIENTED GENERAL OCEANOGRAPHY

Anderson, Frank E. 1978. LABORATORY MANUAL FOR INTRODUCTORY OCEANOGRAPHY. Senior high/freshman-college. Burgess Publishing Co., Minneapolis. A 12-unit laboratory covering aspects of chemical, physical, and geological oceanography. All exercises are "hands on" with actual experimentation.

Aquarium Systems, Inc. No date. EXPERIMENTS USING MARINE ANIMALS. Aquarium Systems, Inc., 33208 Lakeland Blvd., Eastlake, OH 44094.
A series of experiments using live animals. A classroom marine aquarium would be necessary to utilize this book. Experiments include regeneration in sea stars, locomotion in sea stars, nematocysts in anemones, etc.

Balsama, J. J. No date. PREP PARKER RIVER ENVIRONMENTAL PROJECT, VOLS. 1, 2, 3. No date. Parker River National Wildlife Refuge, Newburyport, MA. 01950.
A series of activities to allow student and teacher to discover ecological relationships together using outdoor environmental study sites with most emphasis on marine environments. Aimed for high school level but many can be done at lower levels as well. Available free from Ralph Goodno, Sea Grant and CRD Specialist, Essex County Extension Service, Essex Agricultural and Technical Institute, 562 Maple St., Hathorne, MA 01937.

Baumann, Chris, et al. No date. PRE-COLLEGE OCEANOGRAPHY PROGRAM FIELD GUIDE AND WORKBOOK. Delaware Bay and Wallops Island Marine Science Center. Wallops Island, VA. 23337. 75 p.

Beakley, John C., et al. 1970. THE SOURCE BOOK OF MARINE SCIENCES. U. S. Office of Education. ERIC ED 054 118.
A collection of 45 marine science activities for the high school. A marine science curriculum which includes background information for the teacher. The major topics covered are aquaria, nature of tides, beach analysis, salinity, analysis of populations and a study of a variety of creatures. SB.

Becker, William. 1971. SEACAMP MARINE SCIENCE CENTER. SEACAMP, Inc. Rt. 1, Box 170, Big Pine Key, FL 33043.
Facilities, personnel, and environment of SEACAMP, a year-round marine science education program, are discussed. A sample schedule is included for a three-day marine science program operating at the center. Participation of out-of-state school groups of all ages is encouraged. Gr. 7-12. MB.

Canan, W. Douglas. 1978. A GUIDE TO THE COMMON PLANTS AND ANIMALS OF BOMBAY HOOK NATIONAL WILDLIFE REFUGE IN DELAWARE. Project COAST,* University of Delaware, Newark, DE. 19711. 27 p.
A basic field guide with simple pictorial identification keys.

Carolina Biological Supply Co. No date. 2700 York Rd., Burlington, N.C. 27215.
SEA ANEMONE CULTURE KIT
CULTURING ALGAE
CAROLINA MARINE AQUARIA.

Carr, Richard. No date. LABORATORY EXERCISES. 2728 Mill Ave. Brooklyn, N.Y. 11234.
2 pages. Study of 4-spine stickleback and lamprey. Grades 10-12.

Castellani, George. 1971. HANDBOOK OF TECHNIQUES AND GUIDES FOR THE STUDY OF THE SAN FRANCISCO BAY-DELTA-ESTUARY COMPLEX. Contra Costa County Department of Education. 75 Santa Barbara Rd., Pleasant Hill, CA 94523. 215 p.
This handbook (five parts) was designed for use by students studying the ecology of the San Francisco bay-delta-estuary complex in Project MER, jointly sponsored by the Contra Costa County Department of Education and the Alameda County Schools Office. The contents are monitoring techniques for the measurement of physico-chemical and biological parameters and keys to (1) phytoplankton phyla and genera, (2) invertebrates, (3) coastal marine fishes of California and (4) freshwater and anadromous fishes of California. This project has been funded by the Navy, Associated Sportsmen, Departments of Education, private industries, foundations and Contra Costa College. Gr. 9-12. MB.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711

Chan, Gordon L. 1971. DUXBURY REEF: AN OUTDOOR CLASSROOM. Grades 10-12. College of Marin. Kentfield, CA. 94904. 13 pages.
A field guide unit designed to "help show (teachers) how (they) can take students to a marine environment and not bring back one single specimen."

Chapman, Frank L. and Will Hon. 1970. SALT MARSH, SOUND AND SEA BEACH. Regional Marine Science Project, Carteret County Public Schools. Beaufort, NC. 31 p. Gr. 4-10.

Cole, Richard C. 1970. SUITCASE OCEANOGRAPHY. Brookdale Community College. Lincroft, NJ. 5 p.
This brief article describes an innovative approach to studying oceanography. Inexpensive ideas are presented for easily-stored equipment. The author's contention that the students can best understand the purpose and function of this equipment if it is built in the classroom for use by them is well discussed. Gr. 1-12. MB.

Contra Costa County Department of Education. No date. HANDBOOK OF TECHNIQUES AND GUIDES FOR THE STUDY OF THE SAN FRANCISCO BAY-DELTA-ESTUARY COMPLEX. Project MER. Pleasant Hill, CA. Gr. 7-12. A: Milton Werner, 1611 San Jose Ave., Alameda, CA.

Crossdale, William. No date. ENVIRONMENTAL EDUCATION FIELD GUIDE TO RHODE ISLAND. Marine Bulletin No. 22, University of Rhode Island. Narragansett, RI.

Crowley, John. 1972. FIELD TRIP ACTIVITIES. Hingham High School. Hingham, MA.

Crowley, John, ed. 1972. FIELD TRIP GUIDE. NEMRIP, Narragansett Bay Campus, University of Rhode Island. Narragansett, RI 02882.
Approximately 58 field trips were submitted by teachers attending the Suffolk University Biology Symposium in March, 1972. Contents include aquariums and museums, field activities of the North Shore, South Shore, Cape Cod and out of state, and skin and scuba diving. Gr. K-12. MB.

Cultrera, Sebastian J. No date. FIELD INVESTIGATIONS FOR THE BEACH AND THE MARSH. Regional Academic Marine Program. Kittery, ME 03904. 24 p.
Activities that students can undertake with self-made equipment to study some aspects of beaches, marshes or rocks in their own area. Topics are longshore drift, sand movement on a beach, checking currents, wind-wave relationships and mapping an area. (Title III). Gr. 7-12. MB.

John Dewey High School. No date. LABORATORY AND FIELD MANUAL. John Dewey High School. 50 Avenue X, Brooklyn, NY 11223.

Diehl, Fred A., et al. 1971. EXPERIMENTS USING MARINE ANIMALS. Aquarium Systems, Inc. 33208 Lakeland Blvd., Eastlake, OH 44094. 92 p.
This manual provides a series of simple exercises employing marine organisms which can be completed in a relatively short time with a minimum of equipment. Many of the exercises are open-ended and most contain questions intended to provoke further thought. A bibliography and supplemental information concerning Instant Ocean (synthetic sea salts) is included. Gr. K-12. MB.

d'Ombrain, Selda. No date. BEACHCOMBERS STUDY GUIDE.
A teacher's or leader's guide to common sealife found while beachcombing and how to use these materials in learning activities. Arranged in phylogenetic order. A: Barbara Waters, Cape Cod Extension Service, Railroad Ave., Barnstable, MA.

Driscoll, Andrew L. 1972. A MODEL MARINE SCIENCE LABORATORY. North Kitsap Marine Environmental Center. Poulsbo, WA. U. S. Office of Education. ERIC ED 080 345. 72 p.
A marine science laboratory is developed for teaching and research. Sample activities are also included. SB.

Dudly, G.H. et. al. 1976. LAB AND FIELD INVESTIGATIONS IN MARINE BIOLOGY. Kendall Hunt Pub. Co., Dubuque, Iowa. High school/college.

Dudley, Sara. 1968. A DAY WITH DON AT THE CAPE LOOKOUT SEASHORE. ESEA Title III publication. Carteret County School, NC. Gr. 3.

Dyckman, Claire and Stan Garrod. 1977. SMALL STREAMS AND SALMONID: A HANDBOOK FOR WATER QUALITY STUDIES. Municipality of Seattle, WA. 222 p.
Includes background information and activities for stream study and enhancement projects for schools, primarily secondary, and community organizations.

----. No date. FIELD INVESTIGATIONS FOR THE BEACH AND THE MARSH. Regional Academic Marine Program. Kittery, Maine. 03904. High school. 24 pages.
Activities to study drifts, currents, wind and mapping of beach areas.

Florida State University. 1967. LABORATORY EXERCISES IN OCEANOGRAPHY FOR HIGH SCHOOLS. U. S. Office of Education. ERIC ED 018 399.
Describes laboratory exercises in oceanography developed for use in high schools by teachers enrolled in the 1967 NSF summer institute in oceanography at Florida State University. SB.

Forbes, Lynn, et al. 1969. AN OCEANOGRAPHIC FIELD COURSE FOR THE EIGHTH GRADE. Falmouth Public Schools, Oceanographic Education Center. Box 585, Falmouth, MA 02541. ERIC ED 042 622. 78 p.
This manual contains a suggested field course designed as a supplement to an eighth grade science program. There are six topics (fish, plankton, benthic sampling, bathymetry, salinity determination and environmental conditions) with a discussion, bibliography, lesson plan, and field and laboratory procedure for each topic. An appendix of materials, equipment and sources of supply is included. (Title III). Gr. 8. MB.

Georgia State Department of Education. 1971. FIELD STUDY MANUAL TO FRESHWATER AND ESTUARINE HABITATS. U. S. Office of Education. ERIC ED 056 914.
This program is designed to give the student experiences collecting data. Included are methods of sampling and quantification. SB.

Giles, Donald E. 1969. INDOOR FIELD TRIPS AT THE OSU MARINE SCIENCE CENTER. Marine Science Center. Marine Science Drive, Newport, OR 97365.
The educational effort of the Marine Science Center is described in this publication. A major portion of this effort is devoted to working with school groups from kindergarten through college at the museum-aquarium, and the four-level guide sheet series involved in this work is explained. Occasional marine science activities for classroom use can be obtained from the Center. Gr. K-12. MB.

Haas, John. No date. CHART OF THE OCEANOGRAPHIC STATIONS MONITORED BY THE MARINE SCIENCE LABORATORIES OF THE ORANGE COUNTY DEPARTMENT OF EDUCATION. Orange County Department of Education, Publication Sales. 1300-B South Grand Ave., P. O. Box 11846, Santa Ana, CA 92711. 1 p.

Haas, John and Charles Doyle. 1975. SEASHORE STUDY GUIDE. Environmental Education Publishing Service, Eatontown, NJ. 07724. 32 p.
A guide for investigating various seashore environments, with background information, things to look for, activities for home or classroom.

Hahn, George W. No date. MARINE SAMPLING APPARATUS. MARE. Box 44, Newtonville, MA 02160.

Hon, Will and Larry W. Yeater. 1970. CREATING EFFECTIVE FIELD EXPERIENCES FOR COASTAL SCHOOLS. Carteret County Public Schools. Beaufort, NC. 18 p.

Howe, Mark. No date. STUDENT SYLLABUS. Orange County Department of Education, Publication Sales. 1300-B South Grand Ave., P. O. Box 11846, Santa Ana, CA 92711. 80 p.
A handbook of oceanography including instructions for operation of equipment aboard the Floating Laboratory. A: Orange County Department of Education.

Howe, Mark. No date. MARINE LABORATORY PROGRAMS. Orange Co. Dept. of Education, 26891 Spring St., San Juan Capistrano, CA. 92675. Lists various publications available.

Ingmanson, D. E. 1967. USING THE NEAR SHORE MARINE ENVIRONMENT AS A FIELD LABORATORY. Doctoral dissertation, Florida State University. Tallahassee, FL.

Kahl Scientific Instrument Corp. 1977. ENVIRONMENTAL (EARTH) SCIENCES EDUCATIONAL INSTRUMENT KITS. P.O. Box 1166 El Cajon, CA. 92022.

Kai, Makahiki. 1976. A STUDENT WORKBOOK. Sea Grant College Program, University of Hawaii. 2540 Maile Way Spalding 253, Honolulu, HI 96822.
Contains information about tuna, seaweed recipes, geology, sharks, beaches and erosion, etc.

Kaplan, Eugene H. 1970. INSTRUCTOR'S MANUAL: FREDKIN MARINE LABORATORY. Biology Department, Hofstra University. Hempstead, NY 11550.
Describes the Fredkin Marine Laboratory, British Virgin Islands. Includes descriptions of tropical marine habitats, ideas for projects, tips on organizing courses in tropical marine biology. Suitable for high school and college. A: Kaplan.

Korporaal, Arie. 1976. MARINE SCIENCE FIELD TRIPS IN AND AROUND SOUTHERN CALIFORNIA. L.A. County Superintendent of Schools, Ocean Sciences and Outdoor Education, 9300 Imperial Hwy., Downey, CA. 90242. 87 p.

----------. 1967. LABORATORY EXERCISES IN OCEANOGRAPHY FOR HIGH SCHOOLS. Florida State University. Tallahassee, FL. National Science Foundation. Washington, DC. 90 p.

----------. 1970. LABORATORY INSTRUCTIONS FOR BACTERIOLOGY. Virginia Institute of Marine Science. Gloucester Pt., VA. 6 p.

Lande, Rivian. No date. LAB INVESTIGATIONS FOR MARINE BIOLOGY. Elot Publishing Co. P. O. Box 8294, Long Beach, CA 90808.

Lanier III, James A. and Fred C. Briggs. No date. TIPS ON KEEPING SALT-WATER AQUARIA. Sea Grant Program, Virginia Institute of Marine Science, Gloucester Point, VA. 23062. 3 p.
Pamphlet outlining dangers to avoid.

Lavene, Shirley. 1970. LABORATORY EXERCISES IN MARINE SCIENCE. Science Department, Martin County High School. Stuart, FL 33494. (Oceanography Unlimited, Inc., 108 Main St., Lodi, NJ 07644) 54 p.

Lee, Richard S. 1976. CONSTRUCTION AND MAINTENANCE OF CLASSROOM AQUARIA. Marine Advisory Program, Cooperative Extension Service, University of Alaska, Anchorage, AK. 99504. 17 p.
Tips on purchasing, constructing, setting up, stocking and maintaining classroom aquaria.

Lewis, Bill G. No date. MARINE ECOLOGY LABORATORY MANUAL. Shoretime Community College, 16101 Greenwood Ave., North Seattle, WA. 98133.
Material designed to teach marine technicians technique for studying the intertidal.

Lincoln County School District. No date. THE ESTUARY (A 9 WEEK COURSE). Lincoln County School District. Newport, OR 97365.
A series of activities designed to investigate an estuary. Most activities are field oriented.

Linsky, Ronald B. and Ronald L. Schnitger. 1969. MARINE SCIENCES STUDENT SYLLABUS -- MARINE SCIENCE FLOATING LABORATORY. Marine Science Floating Laboratory Program, Orange County Board of Education. 1104 Civic Center Drive West, Santa Ana, CA 92701. ERIC ED 039 146. 91 p.
This manual, developed for students in the oceanology program aboard Orange County's Marine Science Floating Laboratory, is divided into physical properties and biological properties of the oceans. It includes background and discussion of techniques for studying specific properties of the oceans as well as pictorial taxonomic keys and a glossary of terms. (Title III). Gr. 4-12.

Linsky, Ronald B. and Ronald L. Schnitger. 1971. TEACHER'S GUIDE -- MARINE SCIENCE FLOATING LABORATORY. Marine Science Floating Laboratory Program, Orange County Board of Education. 1104 Civic Center Drive West, Santa Ana, CA 92701. ERIC ED 046 684. 50 p.
Offers instruction on procedures and equipment for teachers taking students on board the marine science floating laboratory. Nansen bottles, oxygen-pH meters, plankton nets, TDC meters, Secchi discs, Van Dorn bottles, Peterson Grab, etc., and specialized and supplementary programs of the vessel are discussed. (Title III). Gr. 9-12. MB.

Los Angeles County Marine Science Program. No date. A DAY AT SEA: STUDENT MANUAL AND TEACHER GUIDE. Los Angeles County Superintendent of Schools, Marine Science Program, Curriculum and Instructi n Services. Los Angeles, CA.

- - - - - - - -. 1973. MARINE AND ENVIRONMENTAL STUDIES FIELD MANUAL. Public Schools of Cranston and Warwick, RI. 139 p.
Background information and field procedures for supplemental high school course in marine and environmental studies.

Marine Science Station. 1972. HANDBOOK FOR SECONDARY EDUCATORS. Marine Science Station Crystal River, FL.

Marine Social Studies Project (MSSP). 1978. COASTAL PROBLEMS AND RESOURCE MANAGEMENT, A SECONDARY SOCIAL STUDIES COURSE. Curriculum Research and Development Group, University of Hawaii, Manoa, HI. 96822.
A one-semester course for secondary school students focusing on the coastal region of the United States and the political, economic and ecological factors involved in the development of coastal resources. Teacher's guide accompanies materials.

Massachusetts Marine Educators. No date. LAB AND FIELD ACTIVITIES AND IMPROVISED EQUIPMENT. NEMRIP, University of Rhode Island. Narragansett, RI 02882.

Monahan, Edward C. and G. Thomas Kaye. 1972. OCEANOGRAPHY FIELD PRACTICUM. University of Michigan Sea Grant Program. 226 p.

Monahan, Edward C., et al. 1972. OCEANOGRAPHY FIELD PRACTICUM SPRING HALF-TERM. University of Michigan. Ann Arbor, MI. U. S. Office of Education. ERIC ED 094 955. 243 p.
A course at the University of Michigan. The author describes student projects, papers, etc. SB.

----------. 1977. NEW HAMPSHIRE'S COAST. New Hampshire Cooperative Extension, UNH Marine Advisory Program, University of New Hampshire, Durham, NH. 03824. 34 p.
A guide to tidepooling, field trips, and activities.

New York Environmental Resource Council. 1972. ADVENTURES ON THE BEACH. Board of Education, City of New York, Publications Sales Office. 110 Livingston St., New York, NY 11201. 104 p. Gr. K-12.

New York Ocean Science Laboratory. 1973. STUDENT LABORATORY EXERCISE IN OCEANOGRAPHY FOR SECONDARY SCHOOL. New York Ocean Science Laboratory. Box 867, Montauk, NY 11954. 41 p.

Oceanography and Living Resources Center. 1969. OCEANOGRAPHY: A COURSE OF STUDY IN MARINE SCIENCE. Texas Gulf Coast Science Educational Resources Center, Houston Independent School District. 11833 Chimney Rock Road, Houston, TX 77035. 138 p.
In this oceanography course, the marine environment is studied with special emphasis on the local physical and biological aspects. Activities of the course include laboratory exercises, field studies, seminars and research. (Title III). Gr. 11-12. MB.

Office of Marine Science. 1971. PACKAGED MARINE SCIENCE PROGRAMS FOR MENTALLY GIFTED MINORS. Orange County Department of Education. 1104 Civic Center Drive West, Santa Ana, CA 92701. 26 p.
This program is designed to provide intellectually gifted minors with a conceptual knowledge of the marine environment through the use of a wide variety of visual aids and a "hands-on" approach to the study of marine organisms. Gr. 1-12. MB.

Olivieri, Frederick J. OCEANOGRAPHY AND MARINE SCIENCE LESSON MATERIALS. Curtis High School, Hamilton Ave. and St. Mark's Place, St. George, Staten Island, N.Y.

Orange County Department of Education. No date. COMPILATION OF DATA COLLECTED ABOARD THE ORANGE COUNTY DEPARTMENT OF EDUCATION'S MARINE SCIENCE FLOATING LABORATORY, FURY II. Orange County Department of Education, Publication Sales. 1300-B South Grand Ave., P. O. Box 11846, Santa Ana, CA 92711.

Orange County Department of Education. No date. TEACHER'S GUIDE, ORANGE COUNTY MARINE SCIENCE FLOATING LABORATORY. Orange County Department of Education, Publication Sales. 1300-B South Grand Ave., P. O. Box 11846, Santa Ana, CA 92711. 60 p.
Includes information to the teacher for scheduling and preparing a class for the Floating Lab field trip. (free with program registration materials) At Orange County Department of Education.

Oyster River Marine Science Program. No date. MARINE SCIENCE--ONSHORE/ONBOARD LABORATORY PROGRAM TEACHER'S KIT--LOBSTERS. Oyster River Marine Science Program. Durham, NH.

Parker River Environmental Project. 1971. PREP: PREFACE AND INTRODUCTION TO ENVIRONMENTAL STUDIES. Parker River National Wildlife Refuge. Northern Blvd., Newburyport, MA 01950. 26 p.
A teacher's guide to four lessons in environmental studies (transect of a salt marsh, soil profile study, contour mapping and environmental art) keyed to field sites at the Parker River National Refuge at Plum Island, Newburyport. Gr. K-9. MB.

Parker River Environmental Project. No date. PREP: VOLUME 1. Parker River National Wildlife Refuge, Northern Blvd., Newburyport, MA 01950.
Lesson #1: a transect study in the salt marsh; lesson #2: soil profile study; lesson #3: contour mapping; and lesson #4: environmental art.

Parker River Environmental Project. No date. PREP: VOLUME 2. Parker River National Wildlife Refuge. Northern Blvd., Newburyport, MA 01950.
Sand transect; marsh study; life along the beaches and tide pools; plant adaptations on Plum Island; design in nature; halt erosion -- plant ammophila; ecology and verse; a study of tidal ranges; variations with a species.

Parker River Environmental Project. No date. PREP: VOLUME 3. Parker River National Wildlife Refuge. Northern Blvd., Newburyport, MA 01950.
Environmental perception; ecology; cottontail rabbit; signs of spring; aerial photography in ecology; muskrats; aquaria; styrofoam cages.

Paula, Shirley. 1975. AN ECOLOGICAL UNIT UTILIZING INVERTEBRATE PHYLA OF THE MID-PUGET SOUND AREA. Grades 9-12. Pacific Science Center Foundation, Sea Grant Education Program, 200 Second Ave. North, Seattle, WA. 98109.
A 6-week teaching unit for grades 9-12 in Marine Ecology. Includes lesson plans, lab sheets, 5-slide-tape presentation, and bibliography.

Philp, Raleigh T. 1976. MARINE AQUARIUM LABORATORY MANUAL. Grades 9-12. Jewel Industries, Inc., Chicago, Ill. 60639. 48 pages.
This lab manual is divided into the physical and chemical properties and the biological properties of a marine aquarium.

Prateon, Patricia. 1970. A FIELD GUIDE TO SELECTED SOUTH SHORE BEACHES, BAYS, ESTUARIES AND MARSHLANDS. Project Lighthouse. 352 Lincoln St., Hingham, MA 02043. 335 p.
A comprehensive presentation of types of shoreline sites and selected outdoor classrooms for field trips. Rocky ocean shore, sandy ocean beach, mud flat, and salt marsh environments are examined, with background reading for teachers. Orientation, field and follow-up activities are presented in detail. This material could be adapted to any coastal area. (Title III). Gr. K-12. MB.

Prince, Paul A. No date. FIELD METHODS IN OCEANOGRAPHY. Indiana University of Pennsylvania, Indiana, PA.

Prince, Paul A. OCEANOGRAPHY- LECTURE AND LABORATORY MANUAL. Indiana Univ. of Pennsylvania, Indiana, PA.

Project COAST.* No date. #244 ABOARD A RESEARCH VESSEL: BEFORE, DURING, AND AFTER. 19 p.
This learning experience suggests activities to do before, during, and after a field trip aboard a marine research vessel. In addition to a slide presentation and a plankton tow, activities include secchi disc reading, sampling water using a Nansen bottle, grab or core sampling, and using an otter trawl. Follow-up activities include examining plankton specimens, setting up a marine aquarium, determining the age of fish using its scales, and analyzing the stomach contents of a fish. This unit also tells how to arrange a field trip aboard a University of Delaware research vessel, what preparations are needed, and what equipment is necessary for all of the suggested activities. Pre- and post-tests, transparency masters of marine plankton types, a list of field identification guides, and checklists of marine invertebrates and fish found in the Delaware Bay are also provided. Gr. 7-12.

Project COAST.* No date. #215 BOMBAY HOOK--A MULTIDISCIPLINARY STUDY OF A WILDLIFE REFUGE. 18 p.
Objectives, procedures, and discussion topics for a field trip to the Bombay Hook National Wildlife Refuge are outlined, including activities in biology (plant and animal identification), chemistry (testing water for pH, dissolved oxygen, salinity, and hardness), math (measuring turbidity), and art (drawing and animal track casting). Gr. 7.

Project COAST.* No date. #208 CAPE HENLOPEN--A MULTIDISCIPLINARY STUDY. 15 p.
This teacher resource packet is a plan for a two-day field trip to Cape Henlopen. Specific objectives, equipment, background, and experimental procedures are outlined for a marsh transect study, seining, a jetty and dune study, and the construction and maintenance of a temporary salt-water aquarium. Art and language arts activities are also suggested. A transparency/handout master of tide marsh plants and a map of Cape Henlopen are included. Has a language arts supplement. Gr. 6-8.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Rabinowitz, Alan, et al. 1970. OCEANOGRAPHY: AN ENVIRONMENTAL APPROACH TO MARINE SCIENCE, SECOND EDITION. Oceanography Unlimited, Inc. 91 Delaware Ave., Paterson, NJ 07503. ERIC ED 045 430. 221 p.
Materials for a full-year course in oceanography are contained in this comprehensive teacher's guide. It provides an environmental approach emphasizing the interdisciplinary nature of the study of aquatic science.

Raimist, Roger J. 1967. LABORATORY EXPERIENCES IN MARINE BIOLOGY FOR UPPER ELEMENTARY AND SECONDARY SCHOOL GRADES, TEACHERS' EDITION. Conservation and Environmental Science Center for Southern New Jersey. Browns Mills, NJ. ERIC ED 039 123. 29 p.
Information about marine aquaria, e. g., oxygen consumption, salinity tolerance, population densities, etc. SB.

Raimist, Roger J. 1967. LABORATORY EXPERIENCES IN MARINE BIOLOGY, STUDY EDITION. U. S. Office of Education. ERIC ED 039 145.
Instructions for laboratory exercises using marine organisms. The exercises deal with measurement of oxygen consumption in fishes, population density, fertilization in the sea urchin, salinity tolerance, and food webs of shore organisms. SB.

Roberts, Ray E. No date. LABORATORY EXERCISES IN MARINE SCIENCE. Martin County Public Schools, FL.

Rose, Dale E., and Jacques S. Zaneveld. 1968. MARINE SCIENCE FIELD TRIP. Educational Series Institute of Oceanography, Old Dominion College. Norfolk, VA. 45 p.

Santana, Henry. 1968. MARINE SCIENCE HANDBOOK. Living Materials Center, Corpus Christi Independent School District. 515 N. Caracahua, P. O. Drawer 10, Corpus Christi, TX 78403.
This comprehensive handbook includes general information on setting up aquaria and on determining chemical and biological seawater parameters, keys to marine animals and plants, diagrams of representative plankton, and detailed field trip activities to jetties, caves, and islands in the Corpus Christi area. References and an extensive bibliography are included. (Title III). Gr. 7-12. MB.

Schlenker, R. M. 1977. AN INTRODUCTION TO THE MARINE ENVIRONMENT: A MINI UNIT. U. S. Office of Education. ERIC ED 128 163.
This unit was designed to introduce preservice teachers to the marine environment. The unit contains four oil pollution experiments. A: Schlenker, U. Maine, Orono, ME.

----------. No date. SECONDARY MARINE SCIENCE STUDENT HANDBOOK. Corpus Christi Public Schools, Education Service Center, Region II. Corpus Christi, TX 78048.
Contains information pertinent to Texas nearshore waters and beaches. Lab activities section includes information about setting up an aquarium, methods to determine salinity, instructions for writing student research papers, sampling methods, etc.

Shenfil, Deborah. 1977. MARINE ECOLOGY RESEARCH PROJECT: JUNIOR HIGH CURRICULUM. Grades 7-9. Instructional Media Services Departments, County Supt. of Schools Office, Alameda County, Hayward, CA. 94541. 266 pages.
A complete marine-environmental education curriculum, divided into 10 chapters. Also included: chapters on marine education activities, a list of resources, field trips, and a glossary. Full of activity suggestions, cross-word puzzles, review questions, fine illus., arts & crafts, etc. Loose-leaf form.

Spangler, David A. 1968. THE DEVELOPMENT OF A LABORATORY ORIENTED OCEANOGRAPHY UNIT FOR JUNIOR HIGH SCHOOL. Masters thesis, Fisk University. Nashville, TN.

Stubbs, Harry C. No date. THE SOUTH SHORE AS A MUSEUM. Project Lighthouse. 352 Lincoln St., Hingham, MA 02043.
Field sites are detailed for earth and life science work on the South Shore of Massachusetts. Excellent background reading for South Shore geology. (Title III). Gr. K-12. MB.

Taylor, Beth. 1970. THE FIELD APPROACH TO COASTAL ECOLOGY. Regional Marine Science Project, Carteret County Public Schools. Beaufort, NC 28516. ERIC ED 061 061. 39 p.
Two units, fall and spring, are designed primarily as three-week study units, each in field ecology, for use as the ecology portion of tenth-grade biology. Coastal environments are used to demonstrate basic principles of ecology. The fall unit utilizes the salt marsh as a classroom in nature; the spring unit utilizes communities of the Outer Banks and coastal mainland communities. (Title III). Gr. 10. MB.

----. No date. TEACHER'S GUIDE FOR THE MARINE SCIENCE FLOATING LAB. Office of the L.A. County Supt. of Schools, 9300 E. Imperial Hwy., Downey, CA. 90242.

Town of Hempstead. No date. A GUIDE TO THE OCEANSIDE MARINE NATURE STUDY AREA. Conservation Department, Town of Hempstead. One Parkside Drive, Point Lookout, NY.

Warwick High School. 1973. MARINE AND ENVIRONMENTAL STUDIES FIELD MANUAL. ESEA Project. Warwick, R.I. (Title III).

Waters, Barbara S. 1977. SMALL OCEANS. Cooperative Extension Service, University of Massachusetts, Amherst, MA. 01003. 29 p.
4-H leader's guide to the art of setting up, maintaining, observing sealife in a marine aquarium with notes on equipment, organisms, food, dealing with natural and unnatural tragedies.

Weiss, Howard M. and Michael Dorsey. 1978. SOURCE BOOK FOR MARINE ENVIRONMENTAL EDUCATION. Project Oceanology. Stamford, CT. 700 p.
A collection of activities, procedures, and concepts dealing with the study of the ocean. Includes how to build oceanographic equipment, plan field studies, and analyze data.

Williams, Hayden. No date. NATURAL HISTORY GUIDE TO THE VICINITY OF THE MARINE STUDIES INSTITUTE AT DANA POINT. Golden West College, Orange County Department of Education. Santa Ana, CA. 9 p.
Includes the geology, birds, and marine biology of the Dana Point area. A: Orange County Department of Education.

Wiper, Harold. No date. LABS DONE BY HAROLD WIPER. Massachusetts Marine Educators, Newton North High School. Newtonville, MA 02160.
(a) Fundulus: a great experimental animal for Marine Biology; (b) marsh study: more muck than mire; (c) halt erosion: plant amophila; (d) a transect study in a salt marsh; (e) marine food web: form the web using your class; (f) soil profile study on the beach; (g) waves in the ripple tank (11-12). Gr. 7-12.

Yeater, L. W. 1967. A FIELD EXPERIENCE--A WHY, A HOW. Regional Marine Science Project, Carteret County Public Schools. Beaufort, NC 28516. ERIC ED 020 830. 13 p.
A guide for teachers in the rationale and techniques of field ecology with special reference to marine environments. This guide outlines the means by which the Carteret County Marine Science Project provides a directed discovery, field-oriented approach to the study of oceanology. (Title III). Gr. K-12. MB.

SECONDARY LEVEL

CLASSROOM ORIENTED GENERAL OCEANOGRAPHY

Abrams, Robert D. 1975. A COURSE: THE MARINE SCIENCES. Outdoor and Environmental Education, Great Neck Public School. 341 Lakeville Rd., Great Neck, NY 11020. 12 p. Course outline with prerequisite of Chemistry and/or Earth Science. Gr. 12. A: R.D. Abrams.

Anderson, Ben, et al. 1977. PRE-COLLEGE OCEANOGRAPHY PROGRAM HANDBOOK. Pioneer Press. Morgantown, WV. 54 p.

Anikouchine, Wm. A. and Richard W. Sternberg. 1973. THE WORLD OCEAN. Senior high and up. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632. 338 pages.
"Covers basic facts of physical, chemical, geological, and biological aspects of oceanography. Explores the complexity of the world ocean and man's transitory understanding of it."

Astro, Richard, editor. 1976. LITERATURE AND THE SEA. (Proceedings of a Conference) Sea Grant Communications, Oregon State Univ., Corvallis, OR 97331. Publication no. ORESU-W 76-001. Joint effort of the School of Oceanography and the Dept. of English to investigate what impact the world's oceans have had on the creative impulse of the writer, as well as investigate how the writer has helped to shape prevailing notions about the sea. 59 pages. Advanced High School,

Awkerman, Gary L. 1974. ESTUARIES. U. S. Office of Education. ERIC ED 086 554. Defines an estuary, describes five types of estuaries, estuarian environments, fluctations, etc. The guide is designed for use in a standard science curriculum. SB.

Awkerman, Gary L. 1973. SEA CHANGES. TOPICS IN MARINE SCIENCE. Charleston County School District. North Charleston, SC. 27 p.

Banta, J., and J. Mayer, Jr. No date. AN INTRODUCTION TO MARINE SCIENCE. Dade County (FL.) Public Schools.

Barton, Jackie. 1977. MARINE SCIENCE, A MINICOURSE. 6017 Cherryhill, Houston, TX 77087. Available by writing J. Barton. Prepared along individualized self-paced lines and developed in accordance with methods and objectives set forth in the Texas Science Framework (draft), Texas Ed. Agency, Austin, Texas. Gr. 10-12. A: J. Barton.

Batten, R. Wesley. 1970. MAN AND THE SEA: A CURRICULUM GUIDE TO OCEANOGRAPHY. Mathematics and Science Center. 2200 Mountain Rd., Glen Allen, VA 23060. 94 p.
This collection of 11 lessons is intended to be used in connection with the OCEANMOBILE mobile exhibit of the math and science center. Each lesson includes concepts to be developed, vocabulary lists, activities, questions for research, references for teacher and student, films, filmstrips and film loops. Gr. 6. MB.

Batten, R. Wesley. 1970. MAN AND THE SEA: KIT TEACHER AID. Mathematics and Science Center. 2200 Mountain Rd., Glen Allen, VA 23060. 87 p. Gr. 6.

Bennett, Lloyd M. No date. MARINE SCIENCE MODULES. Texas Woman's University. P. O. Box 22846, TWU Station, Denton, TX 76204.
These are printed teaching modules designed to be used by the classroom teacher in public schools to make students cognizant of the marine environment with some activities that can be done by elementary youngsters. Gr. 1-6. A: Bennett.

Beach Channel High School. No date. INTERDISCIPLINARY OCEANOGRAPHY FOR THE HIGH SCHOOL. Beach Channel High School. Rockaway, NY.

Bolles, William H. 1973. EARTH AND SPACE SCIENCE. A GUIDE FOR SECONDARY TEACHERS. U. S. Office of Education. ERIC ED 094 956.
The guide includes a unit on the oceans. Basic science information is provided for the user. SB.

_____. 1976. BOOKS AND ARTICLES ABOUT THE SEA. Wometco Enterprises, Inc., Miami Seaquarium, Miami, FL. 33149. 39 p.
Annotated bibliography arranged according to subject matter for educators, students and others interested in the sea.

Brevard County School Board. 1973. MARINE/PHYSICAL SCIENCE MANUAL. School Board of Brevard County, Instructional Division. 705 Avocado Avenue, Cocoa, FL 32922. 524 p.

Bureau of Curriculum Development, Board of Education, City of New York. 1973. INTER-DISCIPLINARY OCEANOGRAPHY FOR HIGH SCHOOL, PART 1. Board of Education, City of New York. 131 Livingston St., Brooklyn, NY 11201. 152 p.

Bureau of Curriculum Development, Board of Education, City of New York. 1973. INTERDISCIPLINARY OCEANOGRAPHY FOR HIGH SCHOOL, PART III. Board of Education, City of New York. 131 Livingston St., Brooklyn, NY 11201. p. 347-478.

Calhoun, Olivia H. 1972. AGRI-BUSINESS, NATURAL RESOURCES, MARINE SCIENCE. GRADE 7, CLUSTER V. District of Columbia Public School. Washington, DC. Department of Career Development. Washington, DC. ERIC ED 089 008. 123 p.

Callaghan, Sara S. No date. TEACHER'S ACTIVITY GUIDE TO COASTAL AWARENESS. University of Rhode Island Coastal Resources Center Marine Bulletin #23, Management Council. 83 Part St., Providence, RI 02903.
With two workbooks, elementary school level.

Carteret County Marine Science Project. No date. PUBLICATIONS. Beaufort, NC 28516.

Chapman, Frank L. No date. PORT: GATEWAY TO THE WORLD OCEAN. Regional Marine Science Project. Beaufort, NC. 13 p.

Chapman, Frank L. 1968. EIGHTH GRADE UNIT, SEA--RESTLESS GIANT. Carteret County Public Schools. Beaufort, NC 28516. ERIC ED 020 053. 44 p.
A unit guide which deals with tides, waves, currents, ocean floors, beaches, etc.

Chapman, Frank L. 1970. THE SEA AND ITS BOUNDARIES. Carteret County Public Schools. Beaufort, NC 28516. U. S. Office of Education. ERIC ED 046 735.
Designed as a three-week unit in marine science at grade 8; topics covered are tides, waves, and beaches. Gr. 8. SB.

Chapman, Frank L. 1970. THE SEA AND MODERN MAN. Carteret County Public Schools. Beaufort, NC 28516. ERIC ED 046 737. 25 p.

Cohen, Maxwell. 1973. INTERDISCIPLINARY OCEANOGRAPHY FOR HIGH SCHOOL, VOLUME II. Bureau of Curriculum Development, Board of Education, City of New York. Brooklyn, NY 11201.

Corpus Christi Public Schools. 1968. MARINE SCIENCE HANDBOOK: STUDENT HANDBOOK. Corpus Christi Public Schools. Corpus Christi, TX.

Dade County Public Schools. 1971. AUTHORIZED COURSE IN INSTRUCTION FOR THE QUINMESTER PROGRAM. SCIENCE: RECREATION AND THE SEA: OCEANOGRAPHY: MARINE ECOLOGY OF SOUTH FLORIDA: AND INVERTEBRATE MARINE BIOLOGY. U. S. Office of Education. ERIC ED 067 175. 109 p.
Describes a program of instruction in Miami, Florida, and Dade County Florida schools. SB.

----------. No date. DECISION-MAKING FOR THE COASTAL ZONE, GRADES 7-12. New Jersey Council for Environmental Education, Montclair State College, Upper Montclair, NJ 07043 44 p.
Suggestions for a wide variety of learning experiences to promote awareness of the environmental and legislative aspects of the coastal zone. All activities are keyed to specific learner objectives and are grouped according to grade level.

De Julio, E. 1969. AN OCEANOGRAPHY COURSE FOR GIFTED STUDENTS AT MOZART PUBLIC SCHOOL. Masters thesis, Northeastern Illinois State College.

Dewees, Christopher M. and Jon K. Hooper. 1978. GYOTAKU-JAPANESE FISH PRINTING. Sea Grant Marine Advisory Publ. 2548. Univ. of Cal., Div. of Ag. Serv., Berkeley, CA. 94720. 8 p.
Step-by-step illustrated instructions for making fish prints with notes on materials and fish anatomy.

Dewees, Christopher M. and Jon K. Hooper. 1975. MARINE EDUCATION BIBLIOGRAPHY. Sea Grant Marine Advisory Publ. 2784. Univ. of Cal. Div. of Ag. Serv., Berkeley CA. 94720. 16 p.
Selected bibliography with listings for algae, birds, environment and biology, fish and fisheries, invertebrates and shore life, marine mammals, oceanography and scuba diving.

Dewees, Christopher M. and Jon K. Hooper. 1975. PRESSING ALGAE. Sea Grant Marine Advisory Publ. 2556. Univ. of Cal., Div. of Ag. Serv. Berkeley, CA. 94720. 2 p.
Materials and methods for collecting and pressing algae.

Driscoll, Andrew. 1971. SEA AND SHORE. Marine Science Center. North Kitsap S. D., Poulsbo, WA 98370. 22 p.
This unit deals with the summer program for sixth grade. Identification keys, data sheets and chemical and physical properties of seawater are a few of the topics discussed on a field experience to collect and identify marine plants and animals. (Title III). Gr. 6. MB.

Dudley, Sara. No date. EXPLORING INNER SPACE. Mathematics and Science Center. Richmond, VA. 56 p.

Duscik, Dennis W. 1974. TEACHING COASTAL ZONE MANAGEMENT. NTIS, U. S. Department of Commerce. 130 p.

Falmouth Public Schools. 1970. HIGH SCHOOL OCEANOGRAPHY. U. S. Office of Education. ERIC ED 043 501. 240 p.
A series of papers designed to aid high school teachers in organizing a course in oceanography. The collection covers the following areas: introduction to oceanography, geology of the ocean, the continental shelves, physical properties of the sea water, waves, ocean circulation, air-sea interaction, sea ice, etc. SB.

Firestone, Mary. NODC EDUCATION RESOURCE LIST. U. S. Dept. of Commerce, National Oceanographic Data Center, Washington, D.C.

Gendel, Esther. 1968. A UNIT IN OCEANOGRAPHY FOR THE JUNIOR HIGH SCHOOL. Masters thesis, St. Joseph College. West Hartford, CT.

Genthe, Henry C., ed. No date. OCEANOGRAPHIC MANUAL. Santa Barbara Underseas Foundation. 2020 Almeda Padre Sierra, Santa Barbara, CA 93103.

Georgia Conservancy. No date. LET THE ENVIRONMENT BECOME YOUR CLASSROOM. Coastal Office. Savannah, GA. 40 p.

Godfrey, Paul J. 1946. GUIDE TO THE STUDY OF MARINE BIOLOGY AND CONSERVATION. Virginia Fisheries Laboratory and College of William and Mary. Williamsburg, VA.

Gross, M. Grant. 1972. OCEANOGRAPHY: A VIEW OF THE EARTH. Grades 10 & up. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632. 497 pages. Geological, chemical, biological, and physical oceanography covered. Helpful summary outlines at the end of each chapter Illustrations, photos, graphs, and charts accompany text.

Hahn, George and Sandy Wiper. No date. ALL ABOARD, AN ENVIRONMENTAL SURVEY OF BOSTON HARBOR. Newton North High School. Newtonville, MA.

Hardin, Jan. 1978. ENDANGERED SPECIES. Project COAST, Univ. of Del., Newark, DE. 19711 50 p. *
Teaching unit designed to introduce students to the economic, ecological and social aspects of the endangered species problem. Includes day-by-day lesson plans, background material and activities.

Heitzmann, William Ray. No date. FROM SAIL POWER TO NUCLEAR POWER: AMERICA'S MARITIME HERITAGE AND ENERGY EDUCATION, ACITVITY BOOK II. Con-Stran Publications. 3600 Conshohocken Ave., Suite 2108, Philadelphia, PA 19131.
This booklet emphasizes a basic process skills approach to the fields of marine and maritime affairs, and energy awareness. Lavishly illustrated, the activity book is designed for the slow learner and non-motivated student. Gr. 5-12. A: Dr. W. R. Heitzmann.

Herbich, John B. 1970. HIGH SCHOOL OCEANOGRAPHY. Falmouth Public Schools. MA. 240 p.

Hon, Will. 1969. THE REGIONAL MARINE SCIENCE PROJECT OF THE CARTERET COUNTY, NORTH CAROLINA, PUBLIC SCHOOLS. U. S. Office of Education. ERIC ED 055 833.
Presents experiments in the use of field ecology as an approach to understanding the coastal environment. SB.

Howe, Mark. No date. STUDENT SYLLABUS. Orange County Marine Science Laboratory Programs, Orange County Department of Education. Santa Ana, CA. 80 p.
A handbook of oceanography including instructions for operation of equipment aboard the Floating Laboratory. A: Orange County Department of Education.

Indiana University of Pennsylvania. 1973. OCEANOGRAPHY: LECTURING AND LABORATORY MANUAL. 2ND EDITION--1973. Indiana University of Pennsylvania. Indiana, PA.

Johnson, Pam. 1978. EDUCATOR'S GUIDE TO GREAT LAKE MATERIALS. Univ. of Wisconsin Sea Grant College Program. 1800 Univ. Ave. Madison, WI. 53706.
Books, films, maps, and pamphlets for classroom use.

Lamie, Richard G. 1967. A FORMAL COURSE IN OCEANOGRAPHY AT THE SECONDARY LEVEL THROUGH INDEPENDENT STUDY; SUMMARY AND FINAL REPORT. U. S. Office of Education. ERIC ED 016 619. 36 p.
A program which was conducted in Valhalla Union Free School District, New York. The document includes lecture materials, bibliographies, etc. SB.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711

Lee, Richard S. 1976. CLOSE-UP PHOTOGRAPHY FOR THE MARINE SCIENCE CLASSROOM. Marine Advisory Program, Cooperative Extension Service, University of Alaska, Anchorage, AK. 99504. 10 p. Designed to aid teachers in developing their own collections of photographic materials for the classroom using a 35 mm camera. Includes tips on film, lighting, outdoor and aquarium shots, and using the results in the classroom.

Lee, Richard S. and F.F. Wright. 1976. BIBLIOGRAPHY OF MARINE TEACHING MATERIALS. Marine Advisory Program, Cooperative Extension Service, Univ. of Alaska, Anchorage, AK. 99504. 40 p. Annotated bibliography of magazines, government publications, books, and films for teaching marine science at all levels.

Linsky, Ronald B., and Ronald L. Schnitger. 1969. MARINE SCIENCE STUDENT SYLLABUS, THIRD EDITION. U. S. Office of Education. ERIC ED 039 146.
This is a manual which was developed for students participating in the Orange County, California, marine science floating laboratory program. It includes background information as well as techniques for studying the key properties of the ocean. SB.

Marine Ecology Research. 1977. JUNIOR HIGH CURRICULUM (GRADES 7-9). Contra Costa County schools, 75 Santa Barbara Road, Pleasant Hill, CA. 94523. 266 p.
Sourcebook for background information, activities, picture keys for invertebrates, fish and seaweed. Animals and plants mentioned are primarily found in the San Francisco Bay Area, but the principles and concepts are general and can be applied to other coastal areas.

Marine Environment Center. No date. SEA AND SHORE, COURSE OUTLINE. Marine Environment Center. Route 1, Box 613, Poulsbo, WA 98370.

Mary, Charlotta B. 1972. ADVENTURES IN ECOLOGICAL READING, LANGUAGE ARTS (EXPERIMENTAL). U. S. Office of Education. ERIC ED 086 529.
This is a collection of reading activities, discussion activities, and experiments for students interested in ecology. SB.

Mastrolia, Lilyan S. 19 2. PICTURE IT. Science Activities.
The unit was expanded to use a large number of prints. National Geographic maps of the ocean floor, study prints, etc. Gr. 8. A: L. S. Mastrolia. 4243 Barrett Rd., Carmichael, CA 95608.

Mastrolia, Lilyan S. 1971. SIX WEEKS COURSE IN OCEANOGRAPHY: A BIBLIOGRAPHY FROM MODERN MEDIA METHODS.
The unit was expanded to use a large number of prints: National Geographic maps of the ocean floor, study prints, etc. A: L. S. Mastrolia. 4243 Barrett Rd., Carmichael, CA 95608.

Mauldin, Lundie and Dirk Frankenberg. 1978. NORTH CAROLINA MARINE EDUCATION MANUAL. Unit One: Coastal Geology, 108 p. Unit Two: Seawater, 76 p. Unit Three: Appendices 36 p. UNC Sea Grant, 105 1911 Building, North Carolina State University, Raleigh, NC. 27607.
Three separate booklets that provide extensive background material and activities that emphasize investigative skills. Behavioral objectives are listed for each section. The materials focus on the North Carolina coast and are designed for intermediate grades and junior high. However, much of it is adaptable for other areas and age levels.

Mayer, John J., Jr. No date. OCEANOGRAPHY 5369.60 SCIENCE (EXPERIMENTAL). Dade County (Florida) Public Schools.

McKinley High School. No date. AQUATIC ECOLOGY CURRICULUM GUIDE. Buffalo Public Schools. Buffalo, NY.

Merdinyan, Mark E. No date. FISHERIES STUDENT STATISTICS. Dept. of Fisheries & Technology, 35 Steamboat Ave. North Kingstown, R.I.
A statistical analysis of the curriculum for the 2 yr. program in commercial fisheries.

Monahan, Edward C., and G. Thomas Kaye. 1972. OCEANOGRAPHIC FIELD PRACTICUM 1972, TECHNICAL REPORT #33. Department of Meteorology and Oceanography, College of Engineering, University of Michigan. 221 p.
College Curriculum Material, written for administration, faculty, and students: present and future. Very specialized. (a) 13 p.-- abstracts on various marine subjects near Woods Hole, Massachusetts; (b) 150 p.-- papers, very specialized (e.g., Anion Responses for Cyclotella nana); (c) specific daily schedules for 6-week course.

Montgomery County Public Schools. 1973. DEVELOPMENT OF A PILOT CAREER CLUSTER CURRICULUM FOR ALL STUDENTS IN A COLLEGE PREPARATORY ORIENTED HIGH SCHOOL. FINAL REPORT. PART I: CURRICULUM DEVELOPMENT. Montgomery County Public Schools. Rockville, MD. 74 p.

Moody, John A. 1974. A NATURALIST'S APPROACH TO ANIMALS AND ECOLOGY. Falmouth Public Schools, Falmouth, MA 02540. 400 p.
Text for studying marine biology and ecology with laboratory exercises to accompany each chapter.

Nicoll, John W. 1972. THE SEA. Instructional Operations Division of the Newport-Mesa School District. 1601 Sixteenth St., Newport Beach, CA 92627.

Nixon, Pendleton H. 1972. PEOPLE AND THE SEA. Coastal Resources Center. Univ. of R.I. Grade 9. "Emphasizes the basic language arts skills of reading, writing, and speaking as well as specific skills such as using figurative language or writing a descriptive essay.

North Carolina State Department of Public Instruction. 1972. WATER QUALITY CONTROL. CURRICULUM GUIDE. State Department of Public Instruction. Raleigh, NC. City Board of Education. Washington, DC. ERIC ED 079 100. 194 p.

Oceanographic Education Center. 1970. HIGH SCHOOL OCEANOGRAPHY. Oceanographic Education Center. Box 585, Falmouth, MA 02541. ERIC ED 043 501. 207 p.
The OEC has compiled this series of 12 papers, with references, covering the fields of general oceanography as well as physical, geological, chemical, and biological oceanography, to aid teachers in organizing a course for high school students. Used in connection with the references, the book contains enough material for a one-semester course. (Title III). Gr. 9-12. MB.

Oceanography Unlimited. 1969. DEVELOPING A MARINE SCIENCE PROGRAM. Oceanography Unlimited, Inc., Educational Bulletin. 1000 Clinton St., Hoboken, NJ 07030.

Office of Instructional Services/General Education Branch, Dept. of Education, State of Hawaii. March, 1978. FIELD KEYS TO COMMON HAWAIIAN MARINE ANIMALS AND PLANTS. Grades 9-12. Intended to help clarify problems involving identification of flora and fauna of the reef and beach areas of Hawaii. Those covered are: common seaweeds, common beach plants, reef corals, hermit crabs, sea cucumbers, shallow water urchins, and tidepool fishes.

Orange County Department of Education. No date. TEACHER'S GUIDE, ORANGE COUNTY MARINE SCIENCE FLOATING LABORATORY. 60 p.
Includes information to the teacher for scheduling and preparing a class for the Floating Lab field trip. A: Orange County Department of Education.

Osis, Vicki, et al. 1972. 4-H MARINE SCIENCE LEADERS' GUIDE. Oregon State University. Corvallis, OR. 28 p.

Perkins, Karen. No date. MARINE SCIENCE ACTIVITIES PACKET. Orange County Department of Education, Publication Sales. 1300-B South Grand Ave., P. O. Box 11846, Santa Ana, CA 92711. Consists of a teacher's guide, bingo game, board game, animal picture cards, word flash cards, and marine animal playing cards. An instruction sheet accompanies the packet with additional ideas for use in the classroom. A: Orange County Department of Education.

Pfund, Rose. 1978. PROCEEDINGS OF THE (1st, 2nd, 3rd) ANNUAL STUDENT SYMPOSIUM ON MARINE AFFAIRS. (plus: Teacher's Guide, and Student Workbook). UH Sea Grant College Prog., 2540 Maile Wy., Spalding 253, Honolulu, HI 96822. High School.

Pincus, Howard J. 1960. SECRETS OF THE SEA: OCEANOGRAPHY FOR [illegible] SCIENTISTS. American Education Publications, Education Center. Columbus, OH. 32 p.

Project COAST.* No date. #1 AUGMENTED MARINE SLIDE INVENTORY. 30 p.
This inventory lists and describes the 310 slides that accompany the eighty-four marine environment learning experiences. Gr. K-12.

Project COAST.* No date. #318 CONSTRUCTION OF A MODEL SOLAR BUILDING. 13 p.
Equipment and supplies list, detailed building procedures, model uses, and references are given. Seven reproducible drawings illustrate the steps in construction. Some teacher background is presented. Further information is available in #317, "Solar Energy Conversion Background Information." Gr. 9-12.

Project COAST.* No date. #239 THE DELAWARE BAY AND ITS BOUNTY. 12 p.
This large, challenging crossword puzzle consists of approximately 360 clues related to the marine sciences and the Delaware Bay. Gr. 7-12.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Project COAST.* No date. #235 ECONOMIC AND POLITICAL EXPLOITATION OF MARINE RESOURCES. 34 p., 12 slides.
This learning experience is designed to enable students, through independent study and group inquiry, to form opinions on four topics: marine resources, marine food resources, whaling, and fur seals. The teacher section contains instructions for each subject area, suggested discussion topics, and pre- and post-tests. The student portion consists of readings, bibliographies, and self-check quizzes for each topic. Twelve slides accompany "Whaling: A Case Study" and "The Fur Seal: A Case Study." Gr. 7-12.

Project COAST.* No date. #315 ENERGY FOR 1970-1990. 15 p.
This introduction to energy studies emphasizes the concept that mineral resources are non-renewable. It includes student background information, classroom discussions, and class activities relating the home environment to the real world. Eight transparency/handout masters, a bibliography, and film suggestions are also provided. Gr. 9.

Project COAST.* No date. #226 KON-TIKI. 12 p.
Two sets of archaeological data are used to formulate a hypothesis on the development of two culturally similar yet geographically isolated primitive civilizations. A procedural outline instructs the teacher on the use of these data journals in class. Information and transparency masters on the Kon-Tiki expedition and the Humboldt Current are provided to illustrate the ocean's possible role in cultural transport. Gr. 7-10.

Project COAST.* No date. #319 NATURAL GAS AS A RESOURCE. 24 p.
This learning experience provides student background, discussion questions, and references on the use of natural gas as a source of energy. Two articles, "The Role of Natural Gas in the Energy Crisis" (reprinted from Catalyst for Environmental Quality) and "The Challenge and Promise of Coal" (reprinted from Technology Review) provide teacher background. Two transparency/handout masters and instructions for the construction of a methane generator are also included. Gr. 9-12.

Project COAST.* No date. #238 POLITICAL DECISION-MAKING: ROLE-PLAYING ACTIVITIES ON THE DELAWARE COASTAL ZONE ACT. 19 p.
Two role-playing activities involve students in complex political decision-making processes and allow them to compare their decisions with the ones actually made. The scenarios represent two different stages of the political decision-making process regarding the Coastal Zone Act: (1) The Governor's formation of a task force, and (2) the Task Force's investigations and recommendations. Scenarios, activities and lists of roles and materials needed are included. Gr. 7-12.

Project COAST.* No date. #211 THE "RA" EXPEDITIONS: THE ARCHAEOLOGICAL AND ANTHROPOLOGICAL BACKGROUND. 28 p.
Based on The "Ra" Expeditions by Thor Heyerdahl, this unit includes a teacher background describing the opposing isolationist and diffusionist theories of the development of culturally similar yet geographically isolated civilizations. With the use of books outlined in a bibliography and fourteen transparency masters illustrating aspects of the ancient Middle American Indian and Egyptian civilizations, the student should be able to answer many of the questions concerning the feasibility of the diffusionist theory. Teacher preparations and pre- and post-tests are included. This learning experience may be used with the other two "Ra" Expeditions units, #212 and #213. Gr. 6-12.

Project COAST.* No date. #212 THE "RA" EXPEDITIONS: THE CORIOLIS EFFECT. 21 p.
Based on The "Ra" Expeditions by Thor Heyerdahl, this unit includes a teacher background describing the opposing isolationist and diffusionist theories of the development of culturally similar yet geographically isolated civilizations. An important aspect of the diffusionist theory is that ancient people crossed the oceans. The effect of the Coriolis force on winds and currents may have facilitated these ocean crossings. Nine transparency/handout masters are provided, as well as pre- and post-tests. Also included are experiments and activities illustrating the principle of the Coriolis effect. This learning experience may be used with the other two "Ra" Expeditions units, #211 and #213. Gr. 6-12.

Project COAST.* No date. #213 THE "RA" EXPEDITIONS: THE PAPYRUS REED. 13 p.
Based on The "Ra" Expeditions by Thor Heyerdahl, this unit includes a teacher background describing the opposing isolationist and diffusionist theories of the development of culturally similar yet geographically isolated civilizations. An important aspect of the diffusionist theory is that ancient people crossed the oceans. The taxonomic and botanical aspects of the papyrus reed, its influence on the ancient Nile civilizations, and its use in the construction of Egyptian boats are described. The suggested activities include science exercises and a plan for building a papyrus raft. This learning experience may be used with the other two "Ra" Expeditions units, #211 and #212. Gr. 6-12.

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* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Project COAST.* No date. #311 SIMULATION GAME: SUPERPORT. 34 p.
This role-playing activity allows students to examine how a superport and its related industries can affect the marine environment. The unit includes a suggested daily schedule, an environmental knowledge and attitude survey, a vocabulary list, a student handbook, student activity suggestions, project and position paper topics, and a teacher-presented lecture outline on oil and the environment. Study guides and questions for the film Crisis in the Estuary and the filmstrip Man's Natural Environment--Crisis through Abuse are also provided. Gr. 10-12.

Project COAST.* No date. #317 SOLAR ENERGY CONVERSION BACKGROUND INFORMATION. 6 p.
Information on solar energy conversion is presented via background material and pamphlets. Various energy sources and the technology of trapping and using solar energy, a photovoltaic cell, and ways of storing solar-electric energy are covered. A bibliography and a diagram of a solar cell are included. Gr. 9-12.

Project COAST.* No date. #243 THE SUBSETS OF A POND. 9 p.
This learning experience can be used either as a student self-study packet or as teacher background. It explains the concepts of sets, Venn diagrams, intersections, unions, and complements. Understanding of set theory is then tested by questions using categories of invertebrates associated with North American pond life. Gr. 7-9.

Project COAST.* No date. #203 TEACHER RESOURCE GUIDE TO THE FILM "CRISIS IN THE ESTUARY." 36 p.
This guide includes the screenplay of the film "Crisis in the Estuary" and teacher background notes on the biology, physical characteristics, pollution, and food web of the Delaware Estuary. Activities include exercises dealing with animal classification, plants, the estuarine ecosystem, food webs, and sources and effects of pollution. Worksheets and five transparency/handout masters are provided. Has a language arts supplement. Gr. 5-10.

Project COAST.* No date. #206 TEACHER RESOURCE GUIDE TO THE FILM "THE ENDANGERED SHORE." 28 p.
This guide suggests activities emphasizing concepts presented in the film. Questions for discussion, ten transparency/handout masters, and the film screenplay are included. Has a language arts supplement. Gr. 5-12.

Project COAST.* No date. #242 UNDERSTANDING ENVIRONMENT. 16 p.
A study of frequently used words in environmental education. Students read four articles which are included in the unit and pick out key words in class discussion. Understanding is tested via a multiple choice inventory, discussions, and classification of words in group headings. References and optional assignments are included. Gr. 5-8.

Project COAST.* No date. #316 WHERE WILL OIL COME FROM NEXT? 19 p.
The feasibility of recovering oil from a variety of sources, such as tar sands, oil shale, and offshore oil deposits, is discussed in this learning experience. Student background reading, a map activity, a worksheet, a bibliography, and three transparency/handout masters are included. An experiment demonstrating the physical properties of oil and the problem of secondary and tertiary oil recovery is also provided. Gr. 9.

Pyle, Robert. 1975. HAWAII NATURE STUDY PROGRAM FOR ELEMENTARY SCHOOL CHILDREN: REEF AND SHORE, TEACHER'S GUIDE. Curriculum Research and Development Group, University of Hawaii. 1776 University Ave., Honolulu, HI 96822. 265 p.

Rabinowitz, Alan. 1969. CURRICULUM OUTLINE FOR ELEMENTARY AND SECONDARY SCHOOLS IN OCEANOGRAPHY AND MARINE BIOLOGY. Oceanography Unlimited. 1000 Clinton St., Hoboken, NJ 07030, 15 p.
This curriculum outline offers meaningful activities to be given over a span of some 80 weeks for a full two-year course of study, or in small blocks for unit study. Lessons, major concepts and understandings and a selected bibliography are also available from Oceanography Unlimited. Gr. K-12. MB.

Rabinowitz, Alan, Toby Bates Sutton, and Edward M. Taylor. No date. OCEANOGRAPHY: AN ENVIRONMENTAL APPROACH TO MARINE SCIENCE. Oceanography Unlimited. 1000 Clinton St., Hoboken, NJ 07030. 216 p.
The materials, exercises, pupil experiences, laboratory experiments and field survey activities found in this manual were developed by teachers and supervisors actively engaged in marine science education. The course will provide students with an environmental approach to oceanography, emphasizing at all times the interdisciplinary nature of the study. Gr. 7-12. MB.

* Project COAST, 204 Willard Hall, University of Delaware, Newark, DE 19711.

Rasmussen, Frederick A. March, 1978. COASTAL AWARENESS: A RESOURCE GUIDE FOR TEACHERS IN JUNIOR HIGH SCIENCE. Grades 7-9. Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, 3300 Whitehaven St., N.W. Washington, D.C. 20235. 92 pages. Includes glossary, Reading List, suggested field and classroom activities.

Rasmussen, Frederick A. COASTAL AWARENESS: A RESOURCE GUIDE FOR TEACHERS IN SENIOR HIGH SCIENCE. Grades 9-12. 72 pages. (address & date same as above)

Reese, Jackson. No date. NEW YORK CITY WATERFRONT. New York City Parks Council. 80 Central Park West, New York, NY 10023.

Ross, David A. 1970. INTRODUCTION TO OCEANOGRAPHY. Grades 11-12 & up. Prentice-Hall Inc., Englewood Cliffs, N.J. 07632. 438 pages. Basic text concerns itself with chemical, biological, physical, and geological oceanography. Charts, illus., photos, biblio., & gloss.

Schweitzer, James P. No date. LSU MARINE SCIENCE TEACHING AID. Louisiana State Univ., Center for Wetland Resources. Baton Rouge, LA.
October, 1972: Measure of Currents; Feb. 1974: Determining Latent Heat;
October, 1975: Evolution of the Sextant; April, 1975: Circulation in Estuaries.

Schweitzer, James P. 1977. THE L.S.U. MARINE STUDIES HIGH SCHOOL CURRICULUM. Center for Wetland Resources, Louisiana State University, Baton Rouge, LA. 70803.
Set of 19 teaching modules designed primarily for the non-marine teacher who wishes to supplement science or social studies with topics related to marine and wetland environments. Each module includes student text, laboratory and field activities, pre- and post-tests and teacher's manual.

----. No date. SEA AND SHORE SUMMER PROGRAM. North Kitsap School of Marine Science. Rt. 4, Box 846, Poulsbo, WA. 98370.

Shafer, Thayer C. No date. NEW ENGLAND AND THE SEA. U. of R.I. Marine Advisory Service. Narragansett Bay Campus, Narragansett, RI 02882. 58 pages.
A student and teacher guide prepared for a 4-H television series on marine science. Topics range from arts of the sea to navigation to coastal zone planning. Amply illustrated with many student projects suggested. Gr. 5-12. MB.

Sheldon, Julia. No date. OCEANOLOGY CURRICULUM GUIDE. Bethpage High School. Bethpage, NY.

Sidney, Ed-Howard. No date. CAREER OPPORTUNITIES: OCEANOGRAPHIC TECHNICIANS. J.G. Ferguson Publishing Co., Chicago, Ill.
Careers in various aspects of marine science that are available to grads of a 2-yr. program.

Snyder, Robert M. 1970. WHAT EVERYONE SHOULD KNOW ABOUT OCEANOGRAPHY. Snyder Oceanography Services. Jupiter, FL. 51 p.

Stephen, C. R. 1969. OCEANOGRAPHY COURSE AT OAKVIEW JUNIOR HIGH SCHOOL. Northeastern Illinois State College. Chicago, IL.

Stoever, Edward C. 1977. SUPPLEMENTAL INSTRUCTIONAL ACTIVITY MODULES ON CRUSTAL EVOLUTION STUDIES. Junior School of Geology and Geophysics, University of Oklahama. 830 Van Vleet Oval, Room 107, Norman, OK 73019.
A set of 50 to 60 1- to 3-day long supplements to existing earth science, marine science, and other curricula, which translates the methods and results of ongoing research into the composition, history and processes of the earth's crust and its application to man's activities into scientifically honest components understandable to students at this level. Emphasis is on "hands on" learning experiences. Gr. 8-10. A: Stoever.

Sutton, Toby B. 1968. OCEANOGRAPHY. Newport-Mesa Unified School District. Newport Beach, CA 92660.

Sutton, Toby B. 1970. OCEANOGRAPHY INSTITUTE--1970. Newport-Mesa Unified School District, Space Science Learning Program. 1601 16th St., Newport Beach, CA 92660. 101 p.

Svatek, M. K. 1968. A STUDY GUIDE IN OCEANOGRAPHY FOR THE CONCORD PUBLIC SCHOOLS. Masters thesis, Boston University.

Taber, Robert W., et al. 1970. AN OCEANOGRAPHIC CURRICULUM FOR HIGH SCHOOLS. U. S. Naval Oceanographic Office. Superintendent of Documents, Government Printing Office, Washington, DC 20402. 35 p.
Outlines for 18 one-hour lectures on oceanology. Each outline lists topics to be covered, suggestions on which topics should be covered most thoroughly, as well as books for further reading, and related films. Appendices list various resources: sources of instructional materials; charts, films, and bibliographies; organizations and publications which can provide further information; and a selection of relevant Scientific American offprints. Gr. 9-12. MB.

Texas Gulf Coast Science Educational Resources Center. 1969. OCEANOGRAPHY--A COURSE OF STUDY IN MARINE SCIENCE. Houston Independent School District. Houston, TX.

U. S. Naval Oceanographic Office. No date. TEACHER'S OCEAN SCIENCE STUDY KIT. Washington, DC 20390.
Contains 22 items, including 11 booklets on various topics. Includes maps and a film list.

Waters, Barbara S. No date. DIAGRAMS OF SEALIFE. Cape Cod Extension Office, Railroad Ave., Barnstable, MA 02630.
Basic information, activity sheets, large-size drawings. Organized according to scientific classification with emphasis on Southeastern Massachusetts marine environments. Elementary and secondary applications.